THE RAILWAY REVIEW

XXXVI. JUNE 6, 1896. No. 23.

HOW A TWIST DRILL WAS INTRODUCED IN CHINA.—A representative of the Cleveland Twist Drill Company in China and Japan describes the manner in which their tools were brought before a large concern in one of the leading cities of China. It seems that he had hired an interpreter and had one of his twist drills with him ready to show, when, after waiting some time, the interpreter failed to put in an appearance. So Mr. Prentiss decided to go alone. After reaching his destination, an immense arsenal, he sent up his business card to the manager. Failing to get a cordial response from that, he next sent up a twist drill. That elicited curiosity from the firm, and he was straightway invited up to explain the curious tool. After making various signs that he wanted a piece of steel, he was brought some iron. That he tossed aside, and hunting around found a piece of the harder metal for himself. Then Mr. Prentiss proceeded to bore hole after hole in it with his twist drill to the amazement and delight of the workmen, whose primitive way of pounding holes in iron is most unsatisfactory. It is needless to add that Mr. Prentiss got a big order before he left that city.

RIVETING AND RIVETS.—About the first requirement when riveting is to be done, says a writer in Tradesman, is to see that the holes are properly punched or drilled, and the rivets of a size to fit the holes. In boiler work the drift pin is too frequently used to bring the holes fair with each other to the discouragement of all good work. The next thing is to see that the rivets are long enough. Good work cannot be done if the rivets are not of sufficient length to allow a proper head to be turned up. It may also well be stated here that too long a rivet should be avoided as good work cannot be done with too much as well as too little stock in the rivets. Also, the rivets must fit the holes. With a rivet too small to properly fill the rivet hole, good work is also an impossibility. And the plates must also be held closely and firmly together when driving the rivets. It is of course impossible to make a tight joint between two plates of metal unless they are brought in contact with each other—and held there. It is one of the strong points of hydraulic riveting that the plates are forced together and held there while the riveting is being done—and in hydraulic and other power riveting it is of vital importance that the rivets be of sufficient length. If a trifle too short when hand riveting is done, the rivets can be coaxed into shape after a fashion; but with the machine riveter there is no chance of doing even a half decent job unless there is stock enough in the rivet to fill the machine set. The test of sufficient rivet length is to have a very slight fin or rim of metal crowd out ball around the heading tool. The fin need not be very wide—it should not even require removing; but it should be there, and of even width all around the outside of the heading tool. In hand riveting the best work is done when a rivet is driven here and there, bolts being used in the other holes to clamp the plates together while the intermediate holes are being riveted.

ECONOMIC WORKSHOP OUTPUT.—The question of the advisability of installing new machinery in a shop should be decided upon its merits, observes W. E. Hall in Cassier's Magazine. If the reduction in the cost by the improved appliances can be shown to represent a percentage of saving greater than is averaged by the plant, the additional expenditure is justifiable. Some of our pessimistic friends will argue that the increased output will be more than the demand will warrant. The fallacy of this argument has been frequently and conclusively shown, for the decreased cost results in a corresponding increased output, which eventually reduces the cost to the consumer, and in that way increases the consumption. The superintendent of one of the largest works in Belgium is known to have remarked in one of his recent trips to the United States that "it is not the first cost of American appliances that concerns us most, but that which will give the greatest output. The time has come when we must recognize this." The necessity for the better facilities was brought about, it was claimed, by the tendency toward higher rates of wages and the additional output which must be obtained per man. The rate of wages does not concern us, but the output in proportion to the wages paid and the fixed charges are the points to which attention is directed. In all instances care should be taken to see that the expenditures are such as to give the greatest return. It is not by any means a difficult matter to be carried away by "fads" and to conclude that by their use great saving is to result, while really the contrary may be found on actual teat. There are features which facilitate rapid operating, such as the speeds of cranes, convenience in handling mechanism, the avoidance of belt shifting, as in direct electric-driven machines, where it is next to impossible to more than approximate the saving that will result by their use. A practical test is necessary to determine their efficiency with any degree of certainty. Sometimes a saving is accomplished by intuition, which is simply good judgment, based on extensive experience. The cases, however, where the efficiency cannot be determined in advance, with some degree of certainty, are exceedingly few.

THE EXPLOSION OF ACETYLENE GAS.—In a communication to the Paris Academy of Science, M. H. Le Chatelier made known the reactions produced by the combustion of acetylene gas and its limits of inflammability. Repeating these experiments, M. Henry Moissan composed, in test tubes, mixtures formed by a volume of acetylene and various proportions of air, increasing from 1 to 25 volumes. All these mixtures, as he announced to the academy, were ignited by a platinum wire brought to a red heat; and that which produced the strongest explosion was the mixture of 1 volume acetylene and 9 volumes of air. He selected a glass tube nearly 1 in. in. diameter, 10 in. long, and 1-50 in. thick, in which he introduced ½ cubic inch of pure acetylene, and 4¾ cu. in. of air, volumes the ratio of which is 1.9. The test tube, closed by a platinum wire exciter, and fixed in a special bracket, was plunged in a glass jar full of water, and covered with a board and a weight of 22 lb. The passage of the electric current caused a very violent explosion, which broke the tube and lifted the board with the weight. One must, therefore, concludes M. Moissan, when using acetylene, carefully avoid the explosive mixtures which it forms with atmospheric air, and which may bring about serious accidents.

TRAFFIC VIA THE "SOO" CANAL.—Comparative statement of commerce east and west bound through St. Mary's Falls canal, Michigan, for month of May, 1896:

EAST BOUND.

Items.	Designation.	U. S. Canal	Can. Canal	Total.
Copper	Net tons	30,369	908	21,277
Grain	Bushels	2,795,061	903,037	3,698,098
Building stone	Net tons	1,907		1,907
Flour	Barrels	577,013	183,903	760,916
Iron ore	Net tons	922,550	341,418	1,263,968
Iron, pig	Net tons	943	2,140	3,083
Lumber	M. ft. B. M.	109,274	1,038	110,512
Silver ore	Net tons	...	...	...
Wheat	Bushels	9,169,672	3,018,032	12,187,704
Unclass'd frt.	Net tons	14,431	2,111	16,592
Passengers	Number	613	418	1,031

WEST BOUND.

Items.	Designation.	U. S. Canal	Can. Canal	Total.
Coal (hard)	Net tons	49,133	12,410	61,543
Coal (soft)	Net tons	263,176	66,271	329,447
Flour	Barrels	50		50
Grain	Bushels			
Manuf'd iron	Net tons	14,394		14,394
Salt	Barrels	22,29		22,292
Unclass'd frt.	Net tons	42,252	8,404	50,656
Passengers	Number	638	251	889

East bound freight, net tons	2,003,087
West bound freight, net tons	464,564
Total	2,467,651
Total craft—United States	2,341
Total craft—Canadian	684
	3,021
Total registered tonnage—United States	2,257,593
Total registered tonnage—Canadian	624,933
	2,882,526

HYDRAULIC PRESS VS. STEAM HAMMER IN FORGING STEEL.—The pressure applied in shaping a body of steel should be sufficient in amount and of such a character as to penetrate to the center and cause flowing throughout the mass. As this flowing of the metal requires a certain amount of time, the requisite pressure should be maintained throughout a corresponding period. The hydraulic press, therefore, is used instead of the hammer to work it into shape. Under its action the forging is slowly operated upon, and the pressure distributes itself evenly throughout the mass, whereas under the high velocity of impact of the hammer the metal has not time to flow, and internal strains, if not always defects, are thereby created. In fact, the cause of failure of many forgings, particularly large ones, can often be attributed to their having been shaped under a hammer of insufficient power where the blow is developed by a high velocity, rather than by weight of falling mass. The difference in the effect of these two methods of forging is apparent in large cylindrical shafts. Those forged under a hammer have concave ends, showing that the blow has not penetrated the forging, but has worked only upon the surface and drawn it out, leaving the central portion behind, and thus producing a tearing strain on the core by which actual cavities may be developed. The reverse is the case with a shaft that has been hydraulic forged. Its ends are either straight or slightly convex. The pressure being definite and constant, and acting slowly but uniformly throughout the distance traversed by each stroke, passes completely through the forging and tends to force out the center, that portion being hottest and, therefore, the softest. In order to insure the most thorough working of the metal, large shafts and similar forgings should be made hollow, where practicable. The production of such forgings is much facilitated by the use of the hydraulic press. The thin walls of the hollow ingot are readily reheated, and the danger of internal cracking during that operation is removed. After reheating a mandrel is passed through the ingot and it is then worked down under the press, the diameter gradually decreasing and the length increasing proportionally. It is much more difficult to hollow forge with a hammer than with a press, especially in long lengths. A slow and even pressure is necessary to draw out the thin cylindrical walls equally and make a shaft which is straight and symmetrical throughout. During this change in shape the metal must, of course, be reheated frequently. Operating on metal that has become too cold to flow would only bruise and tear it.—H. F. J. Porter in Cassier's Magazine for June.

THE FRENCH ROLLER SHIP.—When the pictures of the Bazin roller ship first appeared in various technical publications, a year or more ago, there was a general disposition to regard the ideas of the French inventor as entirely visionary. The boat on rollers was said to be as old as the steam engine, and accounts of the ship which it was proposed to build at St. Denis were read simply on account of the novelty of the scheme. But now that a boat of this kind has actually been built, and is to be tried next month, some of the foremost naval architects of Europe have become thoroughly interested in the experiments, and the leading engineering journals of England are giving considerable attention to the vessel. The experimental boat now nearing completion at the works of the Cail Co., St. Denis, is of the following dimensions: Number of floats, 6; diameter of the floats, 10 meters; length of the boat 39 meters; breadth, 12 meters; superficial area of the midship frame, about 50 meters; burden, 274 tons; power developed by the boiler, 700 horse power, of which 550 horse power will be upon the propeller and 150 horse power on the axes of the floats. There will be a separate engine for the propeller and for each pair of the disc wheels.

A LIGHTHOUSE WITH REFLECTED LIGHT.—The most extraordinary of all lighthouses is to be found on Armish Rock, Stornoway Bay—a rock which is separated from the Island of Lewis by a channel over 500 ft. wide. It is in the Hebrides, Scotland. On this rock a conical beacon is erected and on its summit a lantern is fixed, from which, night after night, shines a light which is seen by the fisherman far and wide. Yet there is no burning lamp in the lantern and no attendant ever goes to it, for the simple reason that there is no lamp to attend to, no wick to trim, and no oil well to replenish. The way in which this peculiar lighthouse is illuminated is this: On the Island of Lewis 500 ft. or so away, is a lighthouse, and from a window in the tower a stream of light is projected on a mirror in the lantern on the summit of Armish Rock. These rays are reflected to an arrangement of prisms, and by their action are converged to a focus outside the lantern, from where they diverge in the necessary direction. The consequence is that, to all intents and purposes, a lighthouse exists which has neither lamp nor lighthouse keeper, and yet which give as serviceable a light—taking into account the requirements of this locality—as if an elaborate and costly lighthouse, with lamps, service room, bedroom, living room, storeroom, oil room, water tanks, and all other accessories were erected on the summit of the rock.

ELECTRIC WELDING IN ENGLAND.—A communication to an English paper giving an account of the practical working of the electric welding process in a shop doing a wide variety of machine forging and repairing, says: "We find the electric welding very useful in cases of breakdown. Not long ago we had a 2-inch countershaft broken, and it caused about twenty hands to cease work until it was made right again. We took the shaft down, stripped the pulleys from it, pieced it up again in one of our welders, and had the men working again in less than 30 minutes. One advantage this system has over the ordinary smith's welding is that there is no waste of metal. We can take two pieces of, say 1½ inch round (iron or steel), saw them each exactly 12 in. long, and when they are welded together and swagged to size they are just 24 in. long. If a steam engine connecting rod broke we could piece it up exactly the length (without the usual way of making two piecings) and keep it up to the diameter. It would need very little labor in polishing it up again, as every piecing only blackens it about 1 inch on either side of the weld. We have riveted together boiler plates and similar jobs by placing the cold rivet in position, applying the current to it, and when sufficiently heated, riveting it up in the usual way."

CHEMICAL ANALYSIS OF IRON.—Among the good works done at the recent convention of foundrymen at Philadelphia, says Age of Steel, was the practical illustration of the value of chemical analysis in determining the quality of Iron. An analysis was made of three samples of iron, in which a determination was made of the proportions of sulphur, phosphorus, silicon, graphitic carbon, and iron found in each sample. The process and the results were demonstrative of the value of chemical analysis, and furnished practical evidence as to the advantages of a chemical laboratory in large foundries. The matter is one of commercial as well as of scientific interest. Many grave mistakes might be avoided with their consequent losses and delays by adopting the chemical method. Of course in the smaller concerns the cost would render the service practically unavailable on a paying basis. Where, however, the expense would be but a fraction in comparison with the advantages secured, there can be no question as to the value of a chemical laboratory in foundry practice. With such demonstrations as the one noted the chemical analysis must sooner or later be more generally appreciated.

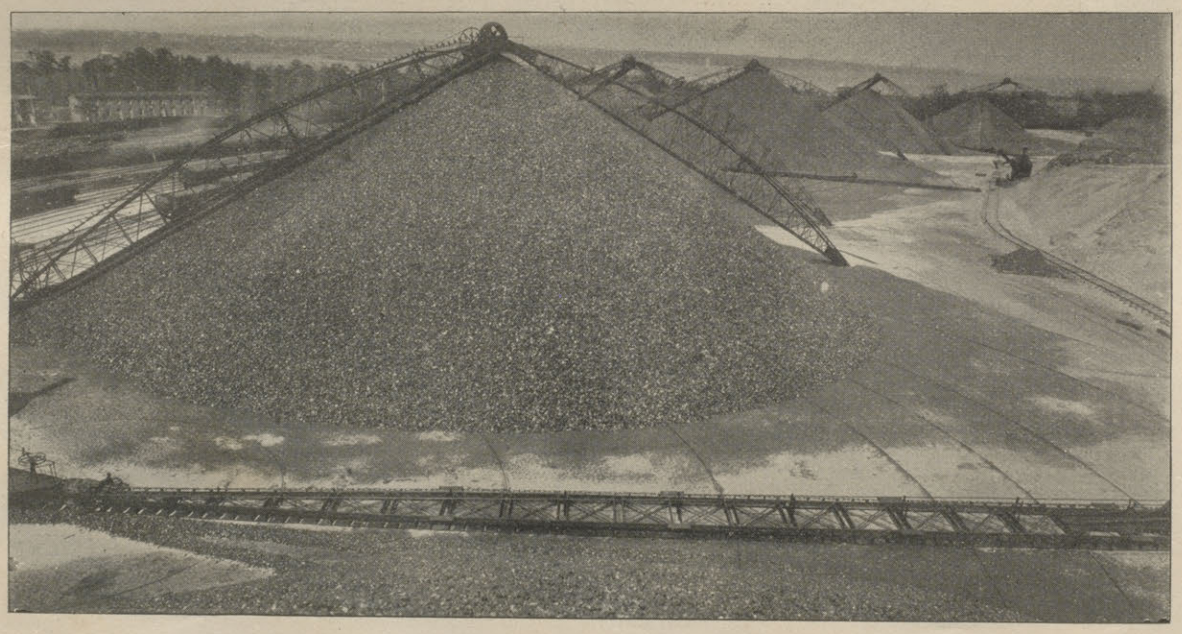
OPERATIONS BEGIN ON THE SOUTHERN OREGON CANAL.—The breaking of the ground for a large mining canal took place last week at a point three miles south of Gold Hill, Ore. At least 1,000 people witnessed the ceremony and enjoyed the barbecue dinner. Short addresses were made by Gov. Lord, Judge C. B. Bellinger, C. F. Beebe and others. The company intends to construct two canals, a lower and an upper canal. The lower canal will be for their own use, and the upper one for the sale of water to companies having ground to work. The company expects to have the canal completed within two years. The size of the channel will be 20 feet wide at the bottom, 6 feet deep and 30 feet at the top. This canal will be taken out of Rouge river. Its present objective point is Foot's Creek,

a distance of about ten miles. Ultimately, however, it wi be extended to and below Grant's Pass about twenty miles. The object of the ditch is to supply water for the immense stretches of gravel bars which lie along the line of the ditch and which are known to be very rich in gold. J. W. Northrup, of Portland, is president; W. H. Hyde, secretary, and Alfred Bouvier, vice president. They are of San Francisco. The capital stock of the company is $5,000,000.

THE DODGE SYSTEM OF COAL STORAGE ON THE ERIE RAILWAY.

After consideration of a number of plans and proposals submitted on invitation, the Erie Railway has contracted with the Dodge Coal Storage Co. of Philadelphia, for a 150,000 ton storage plant on the Dodge system, to be erected on its property at East Buffalo, N. Y. The plant will occupy a space 336 ft. wide by 2,100 ft. long, and will consist of nine divisions, or piles, of about 17,000 tons each. Three tracks will be laid on each side of this space, all stocking out being from cars on one side, while all reloading into cars for shipment will be done on the other side. A complete haulage system will encircle the plant, and all movements of cars from delivery in trains on the ground to making up into outgoing trains, will be accomplished by this means. Incoming trains will be delivered on the stocking side of the plant. Beneath this track are hoppers opposite each division, to receive coal from the bottom-dumping cars. The inner and outer tracks on this side will be used for drilling cars, frequent cross-overs permitting great freedom in this work. On the opposite side of the plant, cars to be loaded will likewise be stationed on the middle track, the outer track on this side being for drilling purposes, and the inner as a screening track.

Much study has been given by both parties to the contract to the arrangement of track facilities, and it is expected that this plant will have greater efficiency than any of its predecessors, as the speed with which coal could be stored or reloaded has heretofore been limited by lack of facility for handling the cars. The plants of the Dodge system now in operation have an aggregate capacity of 1,555,000 tons.



DODGE SYSTEM OF COAL STORAGE—ERIE RAILWAY.

Briefly described, the system consists of inclined scraper conveyors mounted upon steel shear trusses, each conveyor receiving coal by gravity from a track hopper and depositing it upon the ground spanned by the sheer truss. Ingenious devices render this operation gentle in its effect on the coal and reduce breakage to a minimum. Between each two conical piles of coal thus formed is located a ground reloader, consisting of two parts; one, which is horizontal, moves about a pivotal point and is supported by rollers upon circular tracks. The other portion is inclined and rises from the ground to a reloading tower provided with a screen, and from which the coal is delivered into cars upon the reloading track. The pivoted portion is swung by power against the foot of the pile on either side, and the traveling conveyor, mounted on this traveling framework, conveys the coal in one continuous motion from the pile to the tower. This operation also is free from severe action upon the coal, and is, therefore, attended by practically no breakage. The movements of the machinery in both operations are given by driving apparatus of approved design.

The speed with which coal is handled, either in or out of stock, by each machine, is stated to be frequently in excess of three tons per minute, and the system as a whole presents advantages and economies which have led to its adoption by many of the anthracite coal carrying roads. Possibly no better evidence of its value can be given than the fact stated by the builders that every road employing it has at least two plants, the second being installed after experience with the first had demonstrated its economical advantages.

The accompanying illustration is from a photograph of a similar plant located at South Amboy on the Pennsylvania Railroad. The main features of the plants will be alike, except that at East Buffalo the coal piles will be in a straight line, instead of on a curve as at South Amboy; also at the former point the reloading track will be on the opposite side of the storage ground from the tracks on which the coal is received for storage.

RETARDERS IN FIRE TUBES OF STEAM BOILERS.*

JAY M. WHITHAM.

The trials were conducted on a 100 horse power horizontal tubular boiler at the Sutherland avenue station of the Philadelphia Traction Company, Philadelphia. The purpose of the trials was to ascertain under what conditions, if any, retarders in the fire tubes would add to the efficiency of the boiler.

DIMENSIONS AND PROPORTIONS OF BOILER AND SETTING.

Boiler shell	60 in. x 20 ft
Tubes (44)	4 in. x 20 ft
Grates—stationary, herring-bone pattern, air openings ⅜ inch wide, or 46 per cent of grate.	
Grate	5 ft. 4 in. wide by 5 ft. long
Grate surface	26.7 sq. ft
Water-heating surface	1,137 sq. ft
Boiler rated at	1. 0 horse power
Ratio of heating surface to grate area	42. to 1
Steam-drying surface in top of shell	150 sq. ft
Liberating surface in boiler	83.3 sq. ft
Distance from grate to under side of boiler shell	18 in
Distance from top of bridge wall to under side of boiler	10 in
Boiler set with a return pass over the top.	

Ten such boilers are connected to a brick stack 10 diameter by 175 ft. high. During the tests from four to seven of these boilers were run in connection with the boiler tested. On certain tests retarders were used in the tubes. These were made of loosely fitting strips of No. 10 sheet iron, running the whole length of the tubes, and twisted to a pitch of 10 ft., or making two entire convolutions in the length of the tube.

The coal and water were weighed. Observations, at 15 minute intervals, were taken of the pressures and temperatures. The boiler blow-pipe, and feed connections not in use, were blanked off. The calorimeter (Barrus' Universal) was set in the vertical pipe rising out of the boiler.

Before starting the tests the boiler was hot and forming steam. The fires were quickly hauled, and sufficient clean incandescent coal to kindle a new fire was weighed and thrown on the bare grate. At the end of each test the fire was allowed to burn down and was then hauled. The material hauled from the furnace and ash-pit at the end of each test was called ash and refuse. The tests were conducted according to the methods advised by this society, and all instruments used were standardized.

A careful and skilful fireman, fired on all the tests. The boiler tubes were clean at the beginning of each test, while the boiler was fairly clean on the water side. Several of the tests were duplicated in order to make sure that no error existed.

The coal was practically uniform in quality on all the tests. The percentage of ash and refuse varied from 8.72 to 4.25 per cent. The percentage of ash and refuse averaged as follows:

Boiler run at about	50 h.p	8.52	per cent, ash
" "	75 "	6.73	" "
" "	100 "	5.85	" "
" "	125 "	5.37	" "
" "	150 "	5.00	" "
" "	175 "	5.36	" "
" "	200 "	5.06	" "
" "	225 "	4.48	" "
" "	240 "	4.25	" "
Average for all the tests		5.73	" "

This decrease in percentage of ash and refuse as the capacity of the boiler increases is due to the following:

1. When the fires are pushed, as on capacity tests, the damper is open wider than on gentle tests, the draft is stronger, and fine particles of ash, etc., are carried from the furnace and lodged in the dead space behind the bridge wall, deposited in the tubes and front connection, and carried up the stack. Hence it is reasonable to expect a smaller percentage ash as the fires are pushed.

2. On the other hand, it would be reasonable to expect more fuel to be wasted in the ash on a capacity than on a gentle test. But, as a matter of fact, about as much fuel dropped through the grate on the gentle as on the forced tests, and it formed a larger percentage of the total ash.

It is important to here observe that since coal rather than combustible is bought, and since the percentage of ash varies for the reasons just given, that in all comparisons of work done by the same grade of fuel under varying conditions, reference should be had to what the coal, rather than the combustible, does.

The drafts were measured in the furnace, in the front connection, and in front of the damper at the rear end of the return pass over the top of the boiler. The damper was maniplated so that the drafts would be just sufficient to burn coal for the power desired to be developed on each test.

The cost in fuel of a horse power was as follows for the tests made without the use of retarders:

52.4	boiler horse power	3.30	lbs.	dry coal	hour to	1 horse power
71.6	" "	3.21	"	"	"	"
99.7	" "	3.25	"	"	"	"
125.3	" "	3.30	"	"	"	"
150.0	" "	3.24	"	"	"	"
169.6	" "	3.22	"	"	"	"
199.7	" "	3.36	"	"	"	"
217.4	" "	3.51	"	"	"	"
239.0	" "	3.82	"	"	"	"

These results show that there is practically no change in the economic workings of the boiler when run at from 50 per cent below to 70 per cent above its rating, i. e., when making a horse power an hour on anywhere from 21.7 to 6.7 square feet of heating surface.

The cost of fuel per horse power was as follows for the tests made with retarders in the tubes:

52.4	boiler horse power,	3.30	lbs.	dry coal	hour to	one H. P.
77.3	" "	3.21	"	"	"	"
104.2	" "	3.15	"	"	"	"
127.5	" "	3.18	"	"	"	"
148.6	" "	3.14	"	"	"	"
169.1	" "	3. 1	"	"	"	"
197.3	" "	3.23	"	"	"	"
226.1	" "	3.23	"	"	"	"

It is therefore evident that retarders enable a boiler to be run as economically on 5 square feet of heating surface to the horse-power as on 21.7 square feet, or, practically, as on any number of square feet between these limits.

CONCLUSIONS.

1. Retarders in fire tubes of a boiler interpose a resistance varying with the rate of combustion, as shown in Fig. 2.

2. Retarders result in reducing the temperature of the waste gases, and in increasing the effectiveness of the heating surface of the tubes.

3. Retarders show an economic advantage when the boiler is pushed, varying in the tests from three to eighteen per cent.

4. Retarders should not be used when boilers are run very gently, and when the stack draft is small.

5. It is probable that retarders can be used with advantage in plants using a fan or steam blast under the fires, or a strong natural or induced chimney draft, when burning either anthracite or bituminous coals.

6. Retarders may often prove to be as economical as are economizers, and will not, in general, interpose as much resistance to the draft.

7. Retarders can be used only with fire tubular boilers.

8. The economic results obtained on the boiler tested are ideal, showing that it was clean, the coal good in quality, and the firing skilful.

With retarders the tubes are more effectively cleaned than without their use.

9. The tests prove that the marine practice of using retarders is good, and that the claim, often advanced, that they show from five to ten per cent advantage, holds, whenever the boiler plant is pushed and the draft is strong.

*Abstract of a paper before the American Society of Mechanical Engineers, St. Louis, May, 1896.

The mechanical department of the Michigan Central Railroad has just completed a series of carefully conducted tests to determine the pulling capacity of the different locomotives preparatory to putting into effect a plan of rating engines by train weights. The tests were made upon the different divisions at the controling grades, with the view of giving each engine the maximum loads which they are able to handle with economy. The work was under the direction of Mr. Robert Miller, superintendent motive power and equipment.

THE PRACTICAL USE OF HIGH PRESSURE STEAM.*

That Power is added to an engine by simply increasing the boiler pressure is an obvious fact. It is apparent, also, that there is economy in the higher pressure, when we consider that all the heat is lost which is used in raising the temperature of the feed water to boiling point, all that disappearing as latent heat in changing the water to steam, and that which raises the temperature from 212 degrees to that of the exhaust steam, no matter what the ultimate boiler pressure, while it takes comparatively little fuel to raise the pressure higher after it is once generated. Having had occasion to compute just what this saving amounts to, my results may be of interest to those who have never taken the trouble to figure it out.

The formula for the efficiency of a perfect engine is the ratio of the amount of heat utilized to the amount of heat generated, or

$$E = \frac{T - T_1}{T}$$

T representing the absolute temperature of the steam generated, and T_1 that of the steam after it has done its work.

Absolute temperature is measured from that theoretical point where there are absolutely no heat vibrations. As utter darkness is the entire absence of light, so there is supposably a perfect heat vacuum. Experimenters locate this point at 460 degrees below the Fahrenheit zero, and to reduce Fahrenheit degrees to absolute temperature it is necessary to add 460 to the reading of a Fahrenheit thermometer.

I will compare engines using steam at 200 and 130 lbs. boiler pressure assuming in each case that the average back pressure of the exhaust is 5 lbs. to the square inch.

The temperature of steam at 200 lbs. pressure is 387 deg.

130	355
5	228

Reducing each to absolute temperature the figures become

200 lbs.	847 deg.
130	815
5	688

And substituting in the formula we have:

For a 200 lbs. steam engine,

$$\frac{847-688}{847} = .1877$$

For a 130 lbs. steam engine,

$$\frac{815-688}{815} = .1558$$

Subtracting we have, ...0319, and dividing the difference by the latter efficiency we find (.0319÷.1558 =20 per cent)—there is 20 per cent economy in using the higher pressure.

The same result may be arrived at by computation of the heat units, thus proving the correctness of the theoretical demonstration. Now, how to put our theory into practice, is the question. In other words, how can we save $40,000 on a coal bill that has heretofore been $200,000 per year? Short cut-off and long expansion has always been the theoretical demand, but the practical engine driver says, "I find I can run with less coal now by dropping the reverse lever down a little and reducing the pressure by throttling, so why are you talking of increasing the pressure?"

Our stationary engine brothers step in here and say, "Yes, we found the same trouble years ago when the Corless automatic cut-off was invented;" and having less obstacles in the way of varying conditions when experimenting, found that the maximum economy was reached when cutting off at from one-third to two-fifths of the stroke. They discovered that when expanding beyond this point the variation in temperature of the cylinder walls was too extreme. When steam rushes in from the hot boiler it finds the cylinder cooled down to approximately the temperature of the exhaust which has just left it. It is immediately chilled, some of the vapor is condensed to water, and the pressure is materially reduced. When the steam is highly expanded and exhaust takes place, the condensed water re-evaporates and acts retardingly on the piston on the return stroke, while the heat reabsorbed from the cylinder in re-evaporation is wasted.

The successful expansion of steam in more than one cylinder in stationary engines, to obviate this difficulty, has induced inventors to apply the compound principle to locomotives; and without quoting any statistics of good or poor showings, will simply say some remarkable remarkable results have been obtained in some cases where high pressure steam was used in this manner.

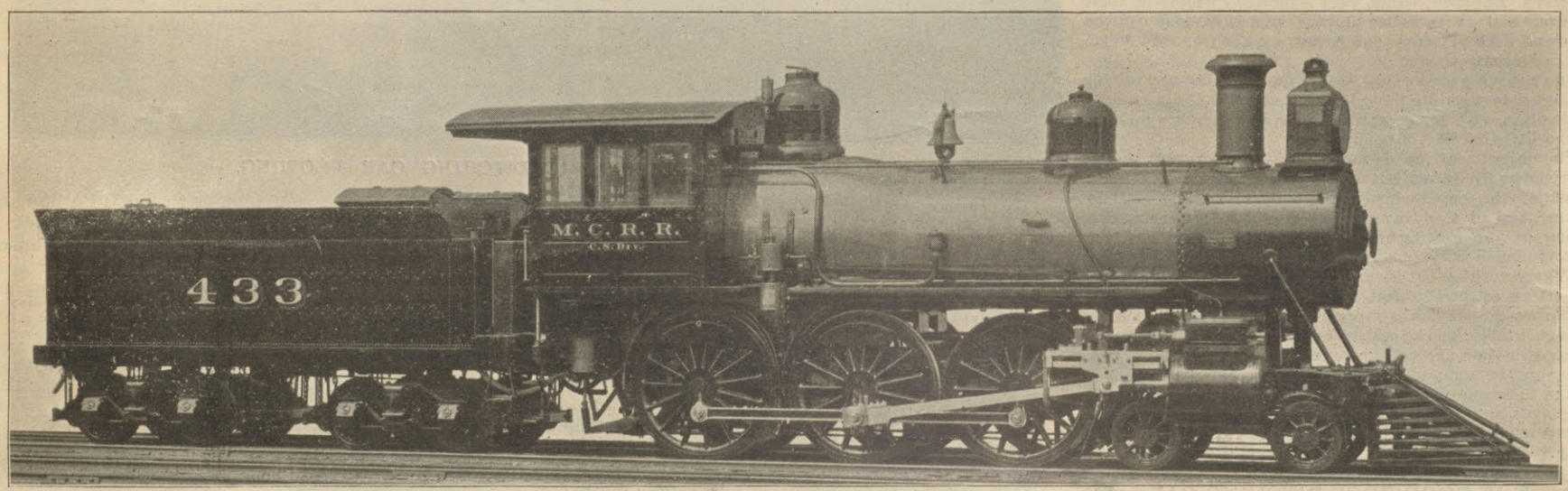
The hard times it is hoped we are now emerging from have compelled us to study economical methods more energetically and persistently than ever before. We have delved into scrap piles and resurrected material; we have invented methods for harnessing new and old forces to labor for us and work it into equipment; we have squeezed the old oil out of discarded packing to lubricate our machines; we have shut down on supplies for cleaning and running them—one company, it is stated, even refuses to issue new brooms to firemen till they have cut the strings on the old ones and worn them down till the handles are bald headed; but we have not materially reduced the largest item of expense in the entire cost of operation, i.e., the coal account.

With the demand for new equipment incidental to the revival of business, an opportunity will be given to experiment further with this principle and assist in perfecting the details, for no matter how prejudiced we may be against innovations and slightly more complicated machinery, we cannot prevent but only retard the compound or some other improved locomotive from realizing the advantages it is hoped this paper has demonstrated lie in our prolific black diamond fields.

*By Mr. J. N. Sanborn before the North-West Railway Club.

Stations.	Arrived.	Departed.	Miles	Minutes.	Speed.
Windsor		1:19-			
RdHouse		1:21-	1.4	1.59	42.35
Pelton		1:27-15	5.7	6.15	54.72
Maidstone		1:31-02	4.4	3.47	69.72
Essex		1:35-00	4.5	3.58	68.04
Woodslee		1:40-40	5.6	5.40	59.29
Ruscomb		1:44-02	3.9	3.22	69.48
Comber		1:48-45	5.0	4.43	63.60
Tilbury		1:54-30	6.6	5.45	68.87
Fletcher,		2:00-40	6.9	6.10	67.14
Buxton		2:04-11	4.1	3.31	69.96
Charing X		2:09-45	6.2	5.34	66.78
Fargo		2:11-55	2.4	2.10	66 48
Mull		2:16-28	5.0	4.33	65.88
Ridgetown		2:21-42	5.9	5.14	67.62
Highgate		2:27-00	5.6	5.18	63.36
Taylor		2:31-19	4.7	4.10	65.28
Rodney		2:34-20	3.4	3.01	67.62
Bismark		2:38-20	4.4	4.00	66.00
Dutton		2:43-46	6 6	5.26	72.84
Iona		2:49-51	5.9	6.05	58.19
Shedden		2:53-15	3.9	3.24	68.82
St. Clair, Jct.		2:57-20	4.9	4.05	72.00
St. Thomas	3:02:05		4.2	4.45	53.05

Windsor to St. Thomas 111.2 miles in 99 minutes and 4 seconds 4 minutes deducted for slow ups at railroad crossings and double track; average miles per hour 67.32.



A FAST SCHENECTADY 10-WHEEL LOCOMOTIVE—MICHIGAN CENTRAL RAILROAD.

A FAST RUN ON THE MICHIGAN CENTRAL.

A record of the fast run of the "Vanderbilt Special" over the Canada Southern division of the Michigan Central Railroad, made May 7, has been received through the courtesy of the Schenectady Locomoive Works, together with a photograph of a duplicate of the engines used to haul the train. The distance traversed was 229.4 miles, between Windsor and Fort Erie, and the speed attained after deducting for stops, is believed to be the fastest ever made for such a distance. The nearest approach to this record is that for the Lake Shore & Michigan Southern fast run made October 24, 1895, which was described fully in the RAILWAY REVIEW of October 26, 1895, page 597.

The Michigan Central train consisted of one baggage and two private cars, weighing 230,050 lbs., or approximately 115 tons. The engines were of the ten-wheel type and were built from the same drawings as the one herewith illustrated, which was one of five built by the Schenectady Locomotive Works for this road in 1889. The cylinders are 19x24 in., the driving wheels 68 in. in diameter. The boiler pressure was 160 lbs. and the weight of the engines in working order was 123,500 lbs., of which 96,300 lbs. were on the drivers. The driving wheels are the same size as those of the Lake Shore engine which made the record of 72.94 miles per hour between Erie and Buffalo Creek, a distance of 86 miles, and it is noteworthy that both of these engines are of the ten-wheel type.

The run on the Michigan Central included 150 miles of single track, which made it necessary to slow up several times in addition to the delays occasioned by railroad crossings. The detailed record of the trip is given by the following tables, which bear the signature of Mr. J. B. Morford, division superintendent of the road.

West division, conductor M. H. Vanlasmond; engineer J. Worden; engine 441, baggage cars one, private cars two.

East division, conductor M. H. Vanlasmond; engineer W. H. Cooper; engine 431, baggage cars one, private cars two.

Stations.	Arr	Departed.	Miles.	Minutes.	Speed.
St. Thomas		3:06-45			
Kingsmill		3:16-00	7.9	9.15	51.24
Springfield		3:20-43	5.3	4.43	67.39
Brownsville		3:26-00	5.5	5.17	62.46
Tilsonberg		3:30-43	5.6	4.43	71.22
Cornell		3:35-29	5.4	4.46	67.99
Hawtrey		3:39-45	5.1	4.16	71.70
PtDover,Jct.		3;41-30	1.2	1.45	41.14
Windham		3:44-35	4.1	3.05	79.74
Waterford		3:49-23	6.6	4.48	82.50
Townsend.		3.56-30	7.2	7.07	60.72
Hagersville		4:00-50	5.5	4.20	76.14
Dufferin		4:04-02	4.1	3.12	76.86
Cayuga		4:09-00	5.9	4.58	71.28
Canfield		4:15-52	6.4	6.52	55.92
Attercliffe		4:21-25	7.4	5.33	80.00
Perry		4:28-20	8.2	6.55	71.10
Welland		4:36-50	9.2	8 30	64.92
Brookfield		4:42-05	4.8	5.15	54.86
Stevensville		4:46-40	5.4	4.35	70.68
Victoria		4:52-29	6.4	5.49	66.00
Fort Erie	4:54-00	4:56-05	0.8	1.31	31.65
Black Rock	5:01-00	5:02-00			
Buffalo	5:11-30				

St. Thomas to Fort Erie 118.2 miles in 96 minutes and 15 seconds, 11 minutes deducted for slow ups at railroad crossings and double track; average miles per hour 73.68.

Windsor to Fort Erie 289.4 miles in 195 minutes and 19 seconds, 15 minutes deducted for railroad crossings and double track switches. Average speed per hour Windsor to Fort Erie 70.44.

Locomotive Fire Kindlers.

The following paper was recently presented by Mr. R. P. C. Sanderson to the Southern and Southwestern Railway Club upon the subject of locomotive fire kindlers:

It is only recently that much has been heard about kindling fires of locomotives by the use of oil instead of cord wood or waste wood from the car shops, and much mystery and many patents have been in evidence since then.

To ascertain exactly how much benefit and economy was to be achieved by discarding wood for kindling fires and introducing the use of oil, experimental apparatus of different kinds were prepared at some of the shops of the Norfolk & Western Railroad, and after a few months of experimental use, with varying success, it was found that the economy by the use of oil as compared with firewood was so great that pressure was then brought to bear on each of the shops to see how little oil could be used for this purpose.

In the first devices experimented with, crude or fuel oil was employed as it was thought that the greater calorific properties of crude were decidedly beneficial. As it was a great inconvenience to carry the small quantities of this

pecial oil in stock at points where cheap black oil used for lubricating cars was carried in storage tanks, the use of crude oil or fuel oil was soon abandoned and lubricating oil used with a small addition of kerosene to make it more inflammable. Subsequently it was found that the addition of kerosene was quite unnecessary and that the lubricating oil was sufficient in itself.

It was then found that by establishing some rivalry between the different shops the quantity oil used could be steadily reduced until the cost per engine for a month's firing up had dropped to one and one-fifth cents per engine. Subsequently to this it was further found by one of our master mechanics, that the oil was entirely unnecessary, and that by heaping up lump coal in a mound a short distance from the fire door and by throwing the usual handful of greasy waste (discarded by the wipers) on the face of this coal pile, setting fire to this waste, and then directing a jet of compressed air directly on this small handfull of burning waste, the flame from it can be driven right into the coal pile, and that in the course of four or five minutes, or possibly a little longer, according to the condition of the coal and the pressure of the air used, the mound or heap of coal can be brought to a good red heat ready for spreading over the grate bars without the use of any oil whatever. This plan has been found to be successful with the Pocahontas coal, Clinch Valley coals, and Thacker and semisplint coals used on the Norfolk & Western Railroad, which vary somewhat widely in their nature, and it is believed that this same plan can be followed with any coal that is not too hard or slow burning in its composition.

I do not wish to say that we do not now use any oil for firing up, because we have found that with the use of a little oil in with the compressed air, it will hurry up matters a little in cases of emergency.

The majority of the engines fired which are referred to, have large fire-boxes ten feet or more in length, and at most of the engine houses the boilers are filled with hot water, and in this way considerable economy in time in firing up and getting engines ready for service has been accomplished without any injury to the boilers.

Where nothing but air is used to ignite the coal, it will be found ordinarily that it does not pay to handle the scrap wood from the car repair tracks or the old ties or bridge lumber, as the cost of cutting it up and handling it is greater than the small amount of coal consumed in compressing the air, and to get rid of this old material it is found to be more economical to sell it as fire wood to the employes and public at a small price, or to burn it up in heaps where it lays, if it cannot be got rid of in any other way.

THE DODDRIDGE DITCHING CAR.

The St. Louis Southwestern and the St. Louis, Iron Mountain & Southern Railways, have for some time past been using a grading and ditching car which is such a radical departure from anything in this line previously in use as to warrant more than passing notice. Both of these lines have long sections of track which extends through low marshy ground where drainage is an unusually important item. The only ballast is the natural earth, and the excavation and maintenance of ditches for giving proper drainage is very expensive. With a view of decreasing this expense and at the same time doing better work, the car referred to was designed by Mr. W. B. Doddridge while he was general manager of the St. Louis Southern Railway. The first car turned out was an ordinary flat car with such changes and attachments as were necessary for accomplishing the desired results, and the work done was so successful and satisfactory that a second one has been designed and built as shown in the accompanying illustrations, Figs. 1 to 4 inclusive.

The car is 49 ft. 6 in. long and is built entirely of steel. The side sills are plate girders 18 in. deep, each composed of 1 plate ½ in. thick and 4 angles 6x4 in. The center sills are the same depth and are composed of a ⅝ in. plate and angles, 3½ x 3½ in. This frame is strongly braced by cross bracing and is carried on two diamond trucks having the American Steel Foundry Co.'s cast steel bolsters. A jib crane 9 ft. high is mounted on the center of the car having a reach of 14 ft. from the center of the car. This crane is firmly seated in a heavy frame below the car. It will swing through a complete circle and like every attachment of the car is operated entirely by compressed air. The cylinder for hoisting, placed beneath the floor of the car, is 12 in. in diameter and has a stroke of 14 ft. 7 in. The cylinder for swinging the crane is also 12 in. in diameter and has a stroke of 9 ft. 5 in. The swinging is done by gearing placed on the mast of the crane which engages a rack attached to the piston rod of the cylinder. For hoisting a wire cable is used which is passed down through the center of the mast around a sheave, then to the end of the car, around another sheave and then attached to the piston rod of the hoisting cylinder. This results in the most simple construction possible and one which has the least number of parts to wear out. Compressed air is admitted to both ends of the cylinder which gives the operator absolute control of the crane and enables him to instantly apply its maximum power.

FIG. 1.—DODDRIDGE DITCHING CAR—PLOWING.

In addition to the crane cylinders there are 4 air cylinders, each 8 in. in diameter and 5 ft. 4½ in. long, for use as side guides for the attachments to the car. The air supply for all these cylinders comes from the air brake pump on the locomotive and is stored at a pressure of 80 lbs. in three cylindrical reservoirs, each 22 in. in diameter and 10 ft. long, which are secured to the frame beneath the floor of the car. The attachments to the car consist of a plow, scraper, shoulder former and scoop. In all operations the plow is first used. This implement is of cast steel, made in one piece, excepting the mold board which is of heavy boiler plate. It weighs 2,500 lbs. and cuts a furrow 20 in. wide and 36 in. deep. The method of using it is clearly shown in Fig. 1. It is attached to the car in four places. The pulling is done by a wire cable hitched to the end sill of the car which is a steel casting having extensions on both ends for this purpose. The depth of the furrow cut is regulated by the crane which is attached to the end of the beam so that the plow can be run out on top of the ground. The distance of the furrow from the track is regulated by two struts, one of which is attached to the

FIG. 2.—SHOULDER FORMING

beam and the other to the mold board of the plow. The struts are attached to the piston rods of air cylinders and it will be seen that the operator has absolute control of the position of the plow and the work it is doing. After the plow has been run over a section in ordinary work the shoulder former is attached as shown in Figs. 2 and 3 and the embankment smoothed and shaped to the cross section shown in Fig. 8. The manner of attaching the shoulder former is somewhat similar to that of attaching the plow and is clearly shown in the illustration. A templet is bolted to the lower edge of the mold board and carries with it sufficient earth for filling up any low places, and after it has passed over the track is ready for ballasting. On some work a scraper is used before the shoulder former and with it the earth is thrown up toward the track or away from it as desired and in quantities sufficient for giving the

FIG. 3.—FULL VIEW OF SHOULDER FORMER.

FIG. 4.—DODDRIDGE DITCHING CAR—SCOOPING

shoulder former as nearly as possible the required amount of loose earth for working to good advantage.

One of the interesting parts of the apparatus is the scoop, shown in Fig. 4. This is used in cuts where there is not room for throwing surplus earth off a the side of the track and also where the track is being lowered. The plow is first used and then the scoop applied, as shown in the illustration, and in this way surplus earth is carried out to a fill or embankment where it can be used to advantage. The scoop is of steel and holds about 3 cubic yards of earth. With it, and the plow, cuts can be excavated to any depth and to a width of 14 ft. from the ends of the ties. Where there is sufficient room a cut is made on one side of the track and the scoop is then thrown over into this cut and the car used for completing the work, but when there is not sufficient room for this, the earth is thrown out from between the ties by hand, the track lowered and the scoop used for carrying the earth away. The shoulder former is then used and this completes the work, with the exception of placing the ballast. Fig. 5 shows the appearance of a piece of track which has been lowered 4 ft. by this method.

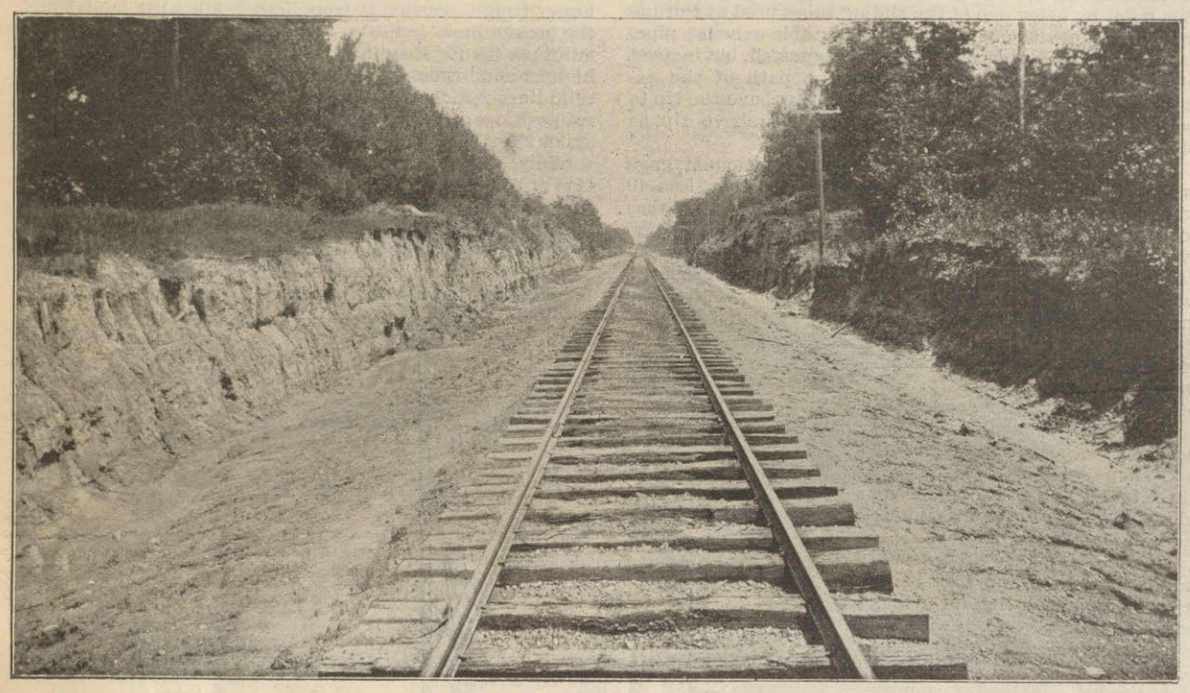


FIG. 5.—APPEARANCE OF TRACK WHICH HAS BEEN LOWERED FOUR FEET.

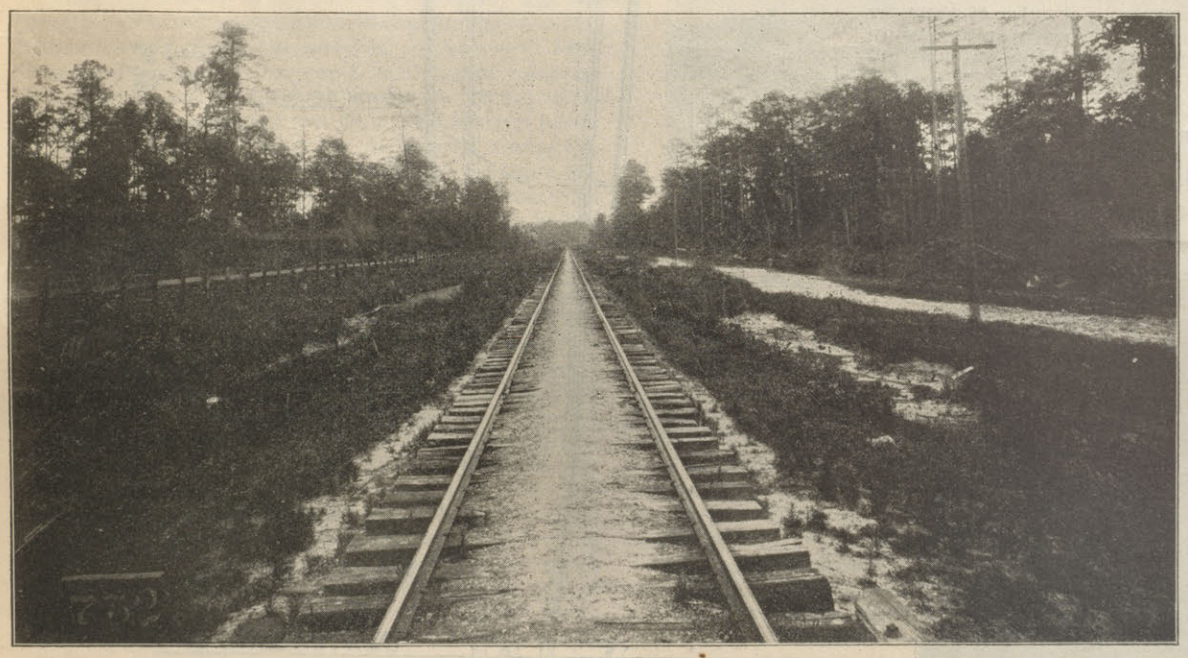


FIG. 6.—BEFORE DITCHER HAS BEEN OPERATED.

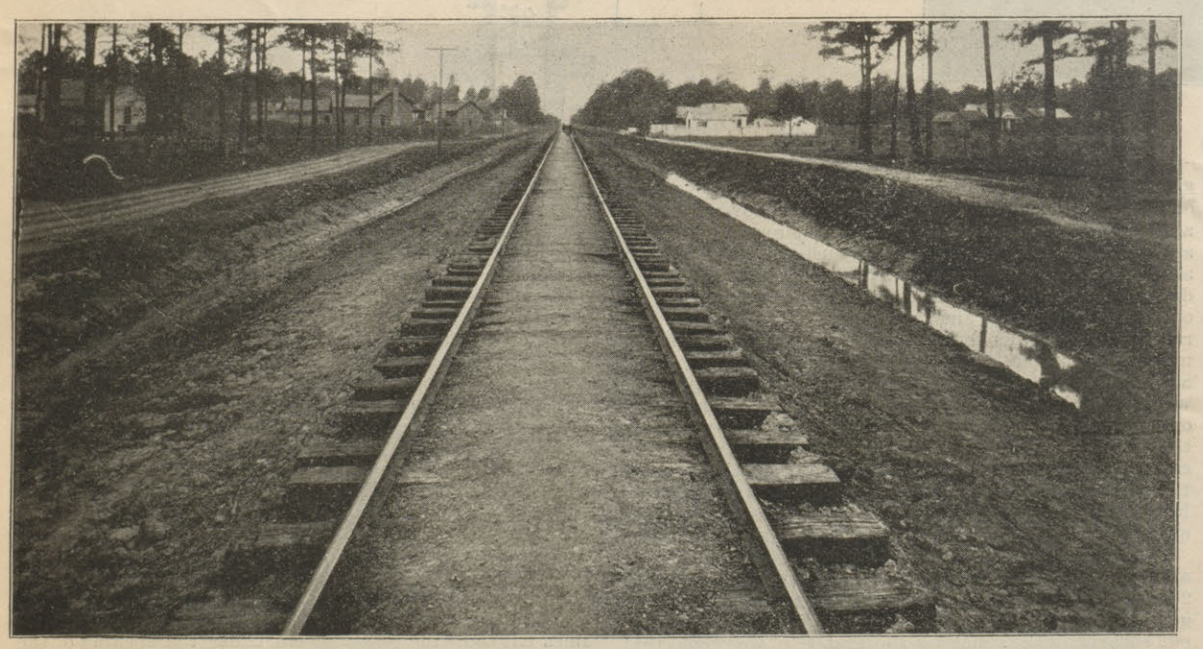


FIG. 7.—AFTER DITCHER HAS BEEN THROUGH.

FIG. 8.—CROSS SECTION OF ROADBED AS LEFT BY DITCHING MACHINE.

The force for operating the car consists of the regular crew, a conductor and two brakemen for the work train, one man for handling the air and two laborers for changing the chain hitches. This makes the entire cost for labor about $18.50 per day, and it is claimed that with one car as much work has been done in one day as can be done by 500 men with shovels by the customary methods. The machine is propelled at a speed of about 4 miles per hour while working. The character of the work done is clearly shown in Figs. 6 and 7, in which Fig. 6 shows the appearance of a piece of track before the machine has been used, and Fig. 7 a piece of the same sort after it has been graded. From the latter it will be seen that the work is far superior to that done in the usual way. Both of the cars built were made by the American Steel Foundry Co., of St. Louis, and that company now has templets, patterns, etc., for building them at a low cost and also has the right to manufacture under Mr. Doddridge's patents, which fully cover all the important features of the car and attachments.

Whitely Malleable Iron in Couplers.

The table given below shows the results of a series of tests which were recently made upon fourteen malleable iron American couplers which were taken from a lot of 1000 couplers which were ready for shipment at the works of the Whitely Malleable Castings Company of Muncie, Ind. The tests were made by Mr. Charles Dunn, representing Messrs. R. W. Hunt & Co. of Chicago. All of the couplers received three blows from a hight of 10 ft., after which they were given more blows from a hight of 15 ft. It is stated that the last six of the couplers were not tested to destruction owing to the fact that the conductor of the tests did not have the time to devote to the purpose and not because of any failure or sign of failure of the couplers.

The standard 1,640 lb. hammer was used and the couplers were placed upon a rigid anvil. The specifications of the road for which the couplers were made, required them to withstand three blows at 10 ft. and two blows at 15 ft. The material as may be seen from the tabulated results must necessarily have been good to have stood such punishment, but in addition to this, it is stated by the inspector that the couplers bent to a remarkable extent before breaking, which is an additional evidence of the good quality of the material. The table is reproduced in the form in which it was received, and the term "O K" undoubtedly means that the couplers were not broken in any way by the treatment which they had received, but unquestionably they were bent by the impact of three and four blows at 15 ft. The fact that the last six were unbroken speaks well for the uniformity of the material. The inspector stated that the iron was unusually good.

Test made May 29, 1896, of 14 American couplers which were selected from a lot of 1,000.

1. Lot 1, 3 blows 10 ft., 9 blows 15 ft., bar broke in shank.
2. Lot 2, 3 blows 10 ft., 6 blows 15 ft., knuckle broke, bar cracked in head.
3. Lot 2, 3 blows 10 ft., 8 blows 15 ft., knuckle broke, bar bent in shank, but solid.
4. Lot 3, 3 blows 10 ft., 9 blows 15 ft., stem cracked.
5. Lot 4, 3 blows 10 ft., 4 blows 15 ft., knuckle broke at third blow, bar broke in shank at fourth blow.
6. Lot 4, 3 blows 10 ft., 9 blows 15 ft., bar broke in shank.
7. Lot 5, 3 blows 10 ft., 8 blows 15 ft., knuckle broke, bar solid.
8. Lot 6, 3 blows 10 ft., 6 blows 15 ft., knuckle broke, bar cracked in back of head.
9. Lot 7, 3 blows 10 ft., 4 blows 15 ft., bar and knuckle both O K.
10. Lot 7, 3 blows 10 ft., 3 blows 15 ft., bar and knuckle both O K.
11. Lot 8, 3 blows 10 ft., 3 blows 15 ft., bar and knuckle both O K.
12. Lot 9, 3 blows 10 ft., 3 blows 15 ft., bar and knuckle both O K.
13. Lot 9, 3 blows 10 ft., 3 blows 15 ft., bar and knuckle both O K.
14. Lot 10, 3 blows 10 ft., 3 blows 15 ft., bar and knuckle both O K.

NOTE.—The last six bars tested were not broken. The inspector said that he thought they would all average 7 or 8 blows as none of them were cracked.

It is stated that the Baltimore & Ohio has decided to equip all its passenger locomotives with the chime whistle.

ANOTHER GLIMPSE OF THE EXHAUST JET

At the April meeting of the Western Railway Club Mr. J. F. Deems of the Chicago, Burlington & Quincy Railroad presented the results of investigations upon the form of the exhaust jet of locomotives and the relation between the jet and the suction of the exhaust. The experiments described were made with apparatus similar in character to that shown by Prof. Goss in a paper presented to the club and which appeared in the RAILWAY REVIEW of November 16, 1895. Mr. Deems described his work substantially as follows:

It was decided to fit up an engine so the pipe could be adjusted as to hight from the running board, by a system of levers, through a range of 7 in. while the engine was in actual service; a vacuum gage was also applied to assist in determining the effect of the exhaust on the smoke-box vacuum as the nozzle was moved up and down. When everything was in readiness the engine was put in different kinds of service, and by noting the effect of the exhaust on the fire as the hight of the pipe was altered, and also by noting the vacuum in the smoke-box as shown by the gage, we finally decided on certain figures and prepared our report accordingly, adding in the nature of an appendix that the all-essential—the all-important—factor was the relative location of nozzle and choke of stack, which should be such that the jet of steam would fill the stack at the choke at all times and thus produce the much talked of piston or pump action; and in this position we seemed to be well supported by the testimony of others who had tilled the same field.

As showing how generally this idea has prevailed, I believe it would not be improper to quote some opinions on the subject. The committee of the American Railway Master Mechanics' Association on this subject in their report in 1894, under the head of "conclusions," have the following: "It is important that the contracted portion of the stack and the exhaust nozzle be so located that the steam will strike the stack at or below the contracted portion. It was found that a variation in the position of the choke in a stack did not materially alter the vacuum when the steam jet struck the stack below the choke, but when calling attention to a very simple device described by Prof. Goss at the October meeting of this club, as having been used at Purdue University for the purpose of ascertaining the exact outline for the exhaust jet, and suggested that we try the same with special reference to determining the suggestion by Prof. Goss—that the jet becomes parallel before entering the stack—as we could quite readily decide this point by using one of the sliding tubes used at Purdue in connection with our sliding or adjustable exhaust pipe.

An engine was at once fitted up as suggested, but instead of using one tube we used five along the path of the exhaust jet ranging from a point 23½ inches above the tip to one 8 inches below top of stack, or 80 inches above tip, as shown in Fig. 1.

On our first trip we tried to use the same vacuum gage we had used in our other work, each leg of which was 10 in. long, but we soon found this would not do, as the tubes located near the choke of the stack would take all the water out of the glass the instant they were put in communication by the piece of hose used for that purpose. I was at a loss to know what to do, when one of the shop men who was assisting me suggested a rather novel idea for constructing a longer gage, which proved entirely satisfactory. An ordinary ⅝ in. water gage glass, such as is in common use on locomotives, was heated and bent into a U shape with the ends about three inches apart; then by using pieces of ½ in. hose about two inches long for couplings, into each end of which he inserted additional glasses, he soon had a manometer, each leg of which was 50 in. long, and before we were through with the work we found they were not much longer than needed. Instead of connecting our vacuum gage direct to the sliding tubes, we used an intermediate air chamber of about 250 cu. in., which gave quite a steady movement to the water in the parallel but in most cases assumed an opposite angle from that shown near the exhaust tip, being contracted in some instances as much as one inch at the choke as compared with a point 7½ in. lower down. This we found to be especially true with a stack measuring 13 in. at the choke instead of 14 in. as shown in the sketch.

The solid lines of the sketch show the form of the jet in heavy freight service at from 15 to 20 miles per hour, while the broken lines indicate fast express service at 55 to 60 miles per hour. Readings were taken for the nozzle in the highest and lowest position in all kinds of service. The solid lines AA show the result with the nozzle in the lowest position, or 42 in. from choke of stack when running about 20 miles per hour in heavy freight service, while the solid lines BB were produced with nozzle in highest position or 35 in. from choke of stack under the same conditions. It will be noticed that the angle is practically the same, but the column of steam is about 2 in. smaller in diameter up to tube No. 2, while from there to the choke the column is parallel instead of being contracted as in the former case, but approaches more nearly the same diame-

FIG. 1—ARRANGEMENT OF TUBES.

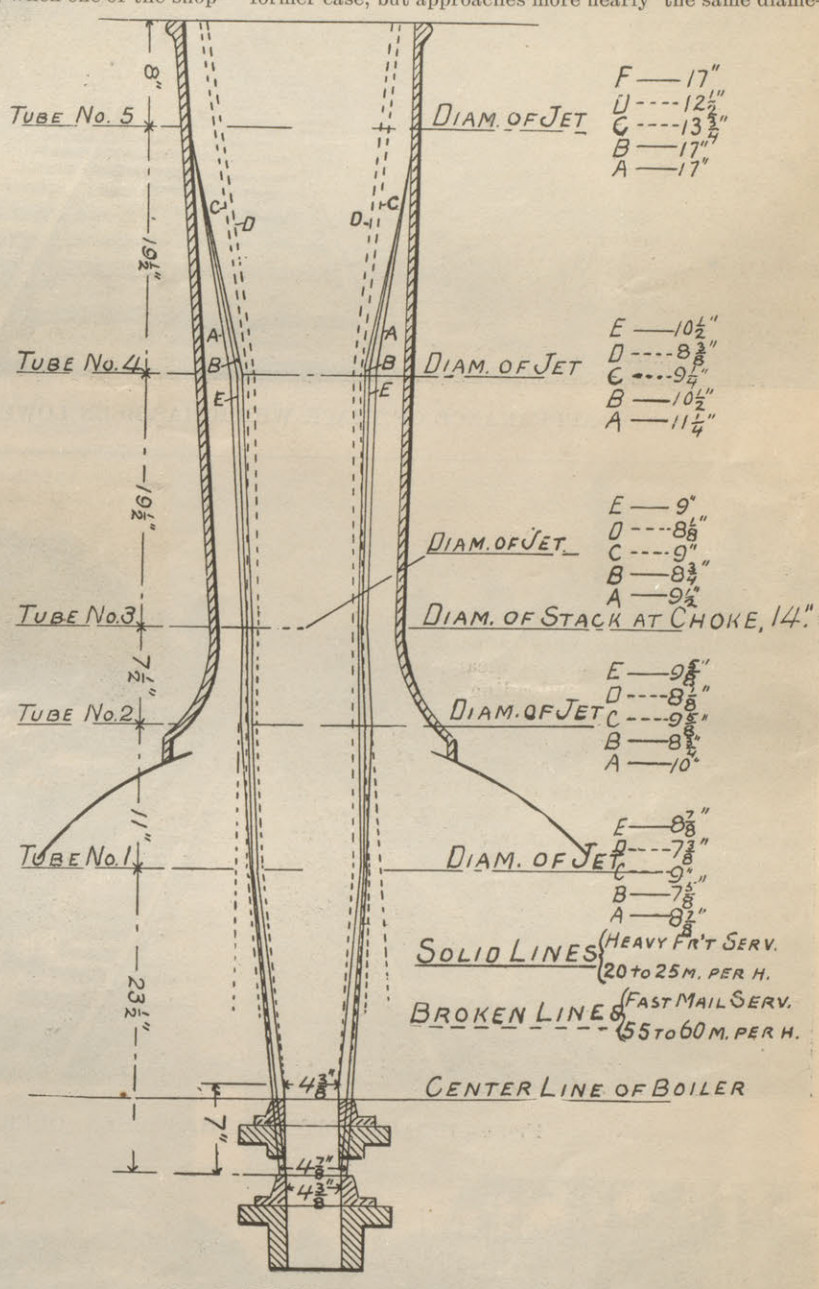


FIG. 2—DIAGRAMS OF EXHAUST JET.

the exhaust nozzle was raised and the choke lowered so that the steam jet struck above the choke, the vacuum was materially reduced."

In the discussion of this report Mr. A. E. Mitchell spoke as follows: "I have run a stack absolutely straight for 8 inches (at the choke), so that, regardless of the position of the exhaust nozzle, I would always fill my pipe. The exhaust steam would always fill that pipe at some point in the 8 inches." Mr. A. E. Benson had the following to say: "I have had some little experience in this matter, and I find that the secret of it is in getting your exhaust pipe down to such a point that your steam will just fill the stack. If it is a 15 in. stack or a 14 in. stack, in my estimation it makes very little difference. But you must get that piston action in the stack. You must get your nozzle down so that the steam w ll expand sufficiently to fill the stack at the base and no more. But I have found on every engine in which I have put single nozzles, that the great secret of it lay in the fact of getting the exhaust pipe just high enough to fill the stack at the base." Mr. Geo. Gibbs said: "My experience coincides with the conclusions of the committee." As late as June 27, 1895, Mr. J. Snowden Bell seems to agree with this view in quoting approvingly some remarks made by Mr. C. H. Quereau at the November, 1893, meeting of this club, which are as follows: "As soon as the exhaust strikes the stack it must act as a pump, the stack being the cylinder and the steam the piston. It therefore follows, that to be most efficient the exhaust should fill the stack from the base to the top, the length of the stack corresponding to the stroke of the pump."

Soon after our report was prepared, and, as I supposed, our work completed, a member of the committee wrote me, glass and enabled us to get very accurate readings. The outer ends of the sliding tubes were turned down so that a piece of small rubber hose could be slipped onto them and make a perfect fit, and then, by using a piece of hose about 4 ft. long, one end of which remained connected to the drum or air chamber, the other end could be changed from one tube to another and readings taken accordingly, a record of which was kept in a log book by having the tubes numbered from one to five, beginning at the bottom. We also used thumb screws to secure the tubes in position when desired, so that by changing the hose quickly from one tube to another while they were held stationary by the thumb screws, it was possible to prove the work very carefully; and I believe it is safe to say that this apparatus will measure considerably closer than 1-10 of an inch, in fact a change of less than 1-20 of an inch was usually quite noticeable.

The engine was put in various kinds of service, and after each trip the findings were plotted as shown in Fig. 2 in which the results of several tests are grouped together for convenience of comparison. You can immagine our surprise when, making the first trip, we found that the jet did not fill the contracted portion of the stack by from 4 to 5 in. In fact the sectional area of the column of steam as compared with that of the inside of the stack at choke is about as 1 to 3 for the largest jet and nearly as 1 to 4 for the smallest. Furthermore we found that a vacuum ranging from 8 to 27 in. was shown in the space surrounding the column of steam; in fact at one time when taking a "run" for a steep hill a vacuum corresponding to 50 in. of water was shown. We also found that Prof. Goss was correct as to the column of steam becoming parallel just before entering the stack; it not only became ter at the choke, and that this difference is maintained to tube No. 4, 61½ in. from nozzle, but from there to the top of the stack they are practically the same. It will be noted that after passing this point the expansion or divergence of the lines is very rapid and the stack is filled at a point somewhere near 8 in. from top, from which it would seem there cannot be much of the piston action, and when we come to consider the broken lines CC and DD which represent a speed of from 55 to 60 miles per hour in express service, there certainly can be none of it, as in this case the steam jet does not fill the stack at any point by several inches, or at least it lacked several inches of filling it 8 in. below the top, and unless the expansion was very rapid above that point it did not fill it at all. Yet with this condition a much higher average vacuum was shown than at the lower speeds where there is possibly a slight piston action near top of stack, the vacuum quite often reaching 20 in. and seldom less than 12 to 13 in. at the choke, and a considerable vacuum was shown for each of the tubes above the choke, being as much as 3 in. at the one near top of stack and 7 in. for tube No. 4. The solid lines EE show the result of enlarging the opening of the tip ½ in., which gives a result quite different from any of the other conditions.

After going over the work carefully with a 14 in. stack and being convinced that the exhaust jet could not be made to fill it under any ordinary service conditions, the question came up as to what would be the result if the diameter of the stack were reduced, and we applied one 13 in. in diameter at the choke only to find that the jet was proportionately more contracted as it approached this point, or with the conditions the same as those that produced lines AA with a 14 in. stack we found we got lines

approximately the same as AA at tube No. 1 and not differing much from there to tube No. 2 but from that point to No. 3 there was a marked difference, as the lines contracted about to the point shown by lines BB at tube No. 3, which seems to show that the more the diameter of the stack is reduced the more the jet will be contracted to meet the conditions.

From what experiments we made it seems certain that with every change of exhaust opening, every change of distance between the exhaust tip and stack, whether by altering exhaust pipe or stack, or with every change in diameter of stack, comes a change in the form of the exhaust jet; and it seems possible that, if proper relations are once established, one part should not be altered without some change in the others in order to obtain the best results. It would also seem to be true that during a trip of 100 to 150 miles, especially over a line with varying gradients, with any given arrangement of draft appliances the form of the exhaust jet undergoes hundreds or perhaps thousands of changes, being appreciably influenced by every change of cut-off, every variation of speed, or possibly by a change of steam pressure, or difference in the volume of air admitted to the tubes, either owing to the condition of fire on grates or irregular opening of the fire-box door.

Another point which seems possible, but which our experiments did not cover, is that owing to the different paths by which the gases approach the choke of the stack and consequent difference in the force with which the impinge against the jet, it may lack considerably of being circular at that point.

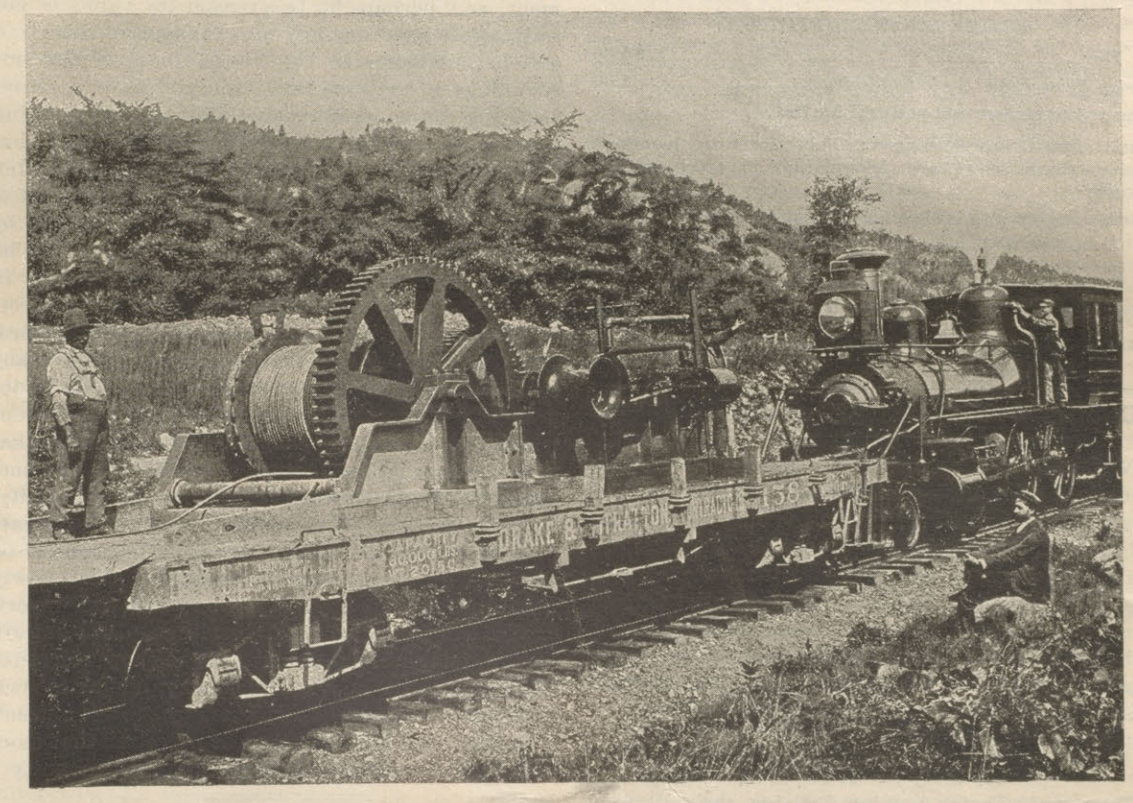
Another thought that occurs when looking at these lines, showing such great difference in the form of the jet at high and low speeds, is that possibly the best results can only be obtained by very different construction for the two classes of service.

THE LIDGERWOOD RAPID UNLOADER.

The Lidgerwood Manufacturing Company has recently published a pamphlet illustrating and describing unloading apparatus adapted to the use of railways and contractors for rapid handling of material for grading and ballasting by means of flat cars. The illustrations shown are from photographs taken on the line of the Delaware & Hudson Canal Co. above Whitehall, New York, and they illustrate the method of operation of the apparatus. The material is loaded upon the cars by means of a steam shovel, the time occupied in unloading seventeen cars being about one and one-half hours, depending however, upon conditions and material. Each car will hold about twenty cubic yards of material when side boards are used. Steel aprons are used to cover the openings between cars. The unloading apparatus consists of two parts, a plow and a winding machine, driven by an engine. This draws the plow through the train by means of a steel cable. The machinery is placed on a car located next to the locomotive, as shown in the accompanying illustration. The engine of the winding machine is compound geared and of the hoisting type specially designed for this work. It has two 10 x 12 in. cylinders and is capable of exerting a pull of 25 tons on the cable, and of drawing in the cable at a speed of 125 ft. per minute. The drum is 42 inches in diameter and is usually grooved for a 1¼ in. cable. In the illustration the steam connection may be seen between the winding engine and the locomotive. This consists of a steam pipe provided with joints, which will enable it to adjust itself to curves and inequalities in the track.

Fig. 1 shows a train partially unloaded, from which the relative positions of the different parts of the apparatus may be seen. The plow shown has a face 48 in. high, the large size being admissible owing to the power of the unloader, whereas a smaller one might overtax the ordinary locomotive, such as are used in construction work, where the pull is made direct upon the cable by the locomotive.

LIDGERWOOD RAPID UNLOADER.—FIG. 1.—UNLOADER AT WORK.



LIDGERWOOD RAPID UNLOADER.—FIG. 2.—OPERATING MACAINERY.

Mr. J. T. Stuart, assistant engineer P. R. R., is quoted as saying that at least 50 per cent more material can be handled with this device than by the old method; also Mr. E. A. Handy, chief engineer L. S. & M. S. R. R., is quoted as saying that one reason why he ordered one of these machines recently was because any light locomotive strong enough to pull the cars would operate this device and that he could not spare heavy locomotives for such a purpose.

The objections to the old method were that with a heavy engine, which was necessary, a bad jerk was given to the cable on account of the necessity of backing up the engine two or three car lengths and giving it a start in order to get the plow through the train. Even then it was frequently necessary to try several times before getting the plow clear through. The breakages of the cable due to these jerks were frequent, and also many draw bars, tender end sills, and bull noses on locomotive pilots were pulled out during the process. By the new method not only are these accidents avoided, but it is not necessary to set the brakes upon the train and the locomotive is not uncoupled. This permits of a great increase in the capacity of the unloader, and the work may be done as well upon a slippery as upon a dry track. Frozen material, which may completely stall the engine of the old method, does not interfere with the working of this equipment. In unloading ballast, the material may be distributed as desired in uniform thickness and the locomotive may pull the train forward at a constant speed, or in unloading material, as at a washout, when for any reason it is all desired at one spot, the train and plow may be moved in opposite directions and the entire load discharged at one place. Curves do not give trouble in using this device and under ordinary conditions snatch blocks are not required.

The pamphlet referred to contains the following quotation from a letter by Mr. A. D. Stout, assistant engineer P. R. R.:

"By the old method a good locomotive like our Class I (weight in working order 95,700 lbs.) was hardly ever able to draw the plow over the entire train without stopping. Each time it stopped it was necessary to back up for two or three car lengths to get sufficient headway to start the plow. The result was a terrific jerk on the cable. This sudden jerk frequently broke the cable, and likewise frequently pulled out either the bull nose and pilot of engine or bull nose and end sill of the locomotive tank. We have frequently had two locomotives coupled together, and even then we were not able to unload by a steady, continuous pull. In one month locomotive repairs cost us $800, and they average about $500. This heavy jerk also frequently derailed the cars in the train, thereby causing serious annoyance and delays to traffic on the main line when that is used. By the new method all these breaks and accidents are entirely avoided."

Those interested in the handling of material such as ballast should obtain a copy of the pamphlet.

NOVEL BRIDGE FOUNDATIONS.—Robert Gilliham, chief engineer of the Kansas City, Pittsburgh & Gulf, has completed a bridge over the Arkansas river without stone or iron piers, which is certainly a novelty in the way of engineering work. Concrete was used, even to the foundations. The work was done by building coffer dams in the stream and pumping out the water. The material above bed rock was then removed and the concrete put in place from bed rock up to the cap. Even the abutments at each end of the bridge were fashioned of concrete. The new bridge has two spans of 50 ft. each, four spans of 127 ft., four spans of 147 ft. and one span of 250 ft. There are 1,943,000 lbs. of steel in the structure. The spans are known as "deck spans," except the 250 ft. one, which is a through span. The total length of the bridge is 1,680 ft. The hight of the rail above the water level is 60 ft. None the less remarkable was the rapid rate of construction. Thirty days after the material was on the grounds the structure was completed.

THE RAILWAY REVIEW

OFFICE OF PUBLICATION:

The Rookery, - CHICAGO, ILL.

Eastern Office: 189 Broadway, New York.

TERMS OF SUBSCRIPTION:

Per Year..... $4.00

Foreign Subscription (including postage)..... 5.00

Convenient binders sent postpaid for $1.00.

PUBLISHED EVERY SATURDAY: Subscribers are requested to give information of any irregularity in receiving THE REVIEW.

Rates of advertising made known on application.

All remittances should be by Draft, Express, or Money Order, payable to THE RAILWAY REVIEW.

Address all communications to THE RAILWAY REVIEW, Rookery, Chicago.

CHICAGO, SATURDAY, JUNE 6, 1896.

NOTHING has occurred during the week in the iron trade to call for any expression of views beyond the fact that consumers are waiting as long as possible before making contracts for material. Manufacturers in all lines of iron and steel making say that there is a general hesitancy to contract. On the other hand it is known there is a great deal of work to be provided for during the last half of the year. Pig iron production has been restricted during the past few days, and structural material has been advanced two dollars per ton.

THE Gould-Trojan coupler decision, the full text of which was published by this journal last week in advance of all others, is remarkable in that, for a legal document, it expresses in the clearest possible terms the distinctive features of mechanical construction so as to permit of no misunderstanding of the opinion. Incidentally it is to be noticed that the court takes occasion to compliment the clearness with which the claims made under the patent were set forth by the inventor himself in contradistinction to the ambiguity which commonly characterizes papers drawn by patent solicitors. The decision has excited much interest among railroad men and it will undoubtedly be much quoted in any future litigation.

THE decision of the United States court in the case of the Joint Traffic Association, although delivered last week was received too late to permit of comment thereon. Nor is such comment important because of the fact that the case will go to a higher court. One thing, however, is significant. Heretofore compacts between railroads looking to the regulation of traffic have been viewed with suspicion and commonly were regarded as being without standing in court. That a contract of the character of the Joint Traffic Association agreement, which has been the subject of the severest denunciation by Senator Stewart and others and which has been so loudly proclaimed as violative of the act to regulate commerce, should be pronounced as wholly within the terms of the law and entitled to recognition by the courts, is a distinctive gain The only fear to be apprehended is that if sustained by the supreme court the agreement may be looked upon by legislators as providing so efficient a means for the control of traffic as to obviate any necessity for the repeal of the pooling clause of the interstate commerce law. This would be a serious mistake. Such agreements are only operative at the will of and to the extent that may seem advantageous to, the parties thereto. As a matter of fact the efficiency of the Joint Traffic agreement lies in the present disposition of the managers of the roads rather than in the strength of the instrument itself, and the best that can be hoped for it is that it will serve its purpose until the law is so amended as to permit of the substitution of a more effective arrangement.

A MORE marked contrast can hardly be imagined than one which was recently seen in a large railroad repair shop which had the accumulated dust of twenty years cleaned from its roof and walls by the application of an air jet, after which a coat of whitewash was applied by means of an atomizer operated by the same power. The job was not an easy one nor was it what might be termed an inexpensive operation, yet it was relatively cheap in view of the direct and indirect advantages which are gained. This is one of the improvements which cannot be made to appear in concrete form in any annual statement, and perhaps for this reason its value is not fully appreciated, but any improvement of this kind which contributes to the cheerfulness of the surroundings of artisans must naturally have a corresponding return in increasing the amount and improving the quality of work performed. There has been for some years a growing tendency toward improving the surroundings of mill hands in respect to the lighting of the rooms by natural means and by careful attention to ventilation and cleanliness. The fact is bewailed by all that many men employed in the routine of shop work have so little real interest in what they are doing, and is not the neglect to provide them with respectable surroundings in many cases largely contributary to this result? It is not necessary to mention in detail the forms of disorder which prevail in many shops, but it is thought that every one can do better work and with less lost motion if the field is clear about his particular locality, which in machine shops applies to the degree of ease with which a man may get around his machine or work. The clean, bright walls of a shop newly whitewashed must impress any one with the importance of this influence of surroundings. It is not difficult to imagine that the men in the shop referred to reflect the light in a practical way; and since such work can be so readily performed by the use of semi-automatic implements it is to be regretted that more officers do not avail themselves of this opportunity.

THE general superintendent of the Illinois Central Railroad is reported to have given orders that hereafter news concerning wrecks on that line is to be freely given out instead of following the altogether too common practice among railroads of withholding the information of this nature. There are of course two sides to this question. Public convenience and welfare demands that the damage and interruption incident to a railroad wreck shall be repaired at the earliest possible moment and from this standpoint nothing must be allowed to interfere or delay such work. On the other hand the personal anxiety of those who may have friends or relatives in the wreck, is of such character as to call for the fullest information and most speedy relief. The trouble arises from the fact that in a great many cases these two demands conflict. The telegraph facilities at a wreck are usually of the most meager character and the proper performance of one duty commonly precludes the possibility of doing the other. The charge of indifference ordinarily made against railroad companies in this connection is altogether unwarranted, although it is possible and indeed probable that their estimate of the importance of the soonest possible restoration of the service has been permitted to obscure the necessity for relief in the other direction. The action of the Illinois Central Railroad in this respect is to be commended. Individual suffering through anxiety on behalf of friends is often times more keen than that occasioned by actual injury, and railroads should display the same energy in relieving the one as they are accustomed to do in relieving the other. Public service although important can afford to wait in such cases and outside of the service necessary to the relief of the injured, that service which will soonest convey full and reliable information to inquiring friends should have precedence. It is of course a gratifying thing for a railroad to be able to say after an accident of a serious character that the movement of trains was resumed in a few hours, but it is much more important that suffering should be relieved than that trains should move. The example of the Illinois Central may well be followed.

THE student of economics cannot fail to be impressed with each recurring labor trouble with the instability of public opinion as to the responsibilitie in the case. Naturally the laboring man is given the benefit of the doubt and sympathy runs toward him regardless of facts; but also naturally when the element of personal inconvenience is forced upon the public, sympathy usually takes the direction which promises to afford the speediest relief. The Milwaukee street car strike up to date affords a remarkable exception to this rule. So far as the strike itself is concerned it may be said to be over. Street cars are running on full time, fully equipped with the necessary men, but the people do not ride. The striking employes have organized "bus" lines with the idea of furnishing a substitute for the street car service, but, as might be expected, they are altogether inadequate to the task, and as a result many people who will not ride on the street cars cannot ride on the buses, and consequently walk. The strangest part of the whole proceeding is that many of these same persons admit that whatever grievance the people as a whole may have against the street railway company, the attitude of the former employes is wholly without justification, and yet the natural sympathy of man for those that are suffering, impels them to extend their moral and some degree of financial support toward a mistaken cause. As between the strikers and the railroad company there can be but one result. Sooner or later traffic on the street car lines will resume its normal condition; the buses will disappear and with them the misguided men who, encouraged by the present manifestation of public opinion, have invested their moderate means to establish them. True sympathy would tend to the quickest possible re-establishment of former conditions in order that the losses which are at present being incurred may not be unduly augumented.

A POPULAR impression has prevailed among many mechanical men to the effect that those steam hammers which strike the hardest and most sudden blows, are most effective upon forgings, and that to obtain the best results, steam pressure should be applied to the upper as well as to the lower side of the hammer piston. Mr. H. F. J. Porter, and also Mr. John Fritz of the Bethlehem Iron Company, laid considerable stress at the recent meeting of the American Society of Mechanical Engineers, upon the fact that in making large steel forgings exactly the opposite was true, namely, that to obtain sound forgings the blow struck by a hammer must be delivered as slowly as possible, and that the work must be done by a heavy weight falling upon the forging rather than by the swift impact of a light weight driven against the piece by virtue of the steam pressure. The hydraulic press has been found to be productive of better results than those obtained with steam hammers because of the ability which the press provides of penetrating to the center of the whole mass of the metal. The working of hot metal under a hammer consists of a flowing of the metal, and as this process requires time, it is easy to see why the press gives better results than the hammer. With the press the load may be kept upon the material for any required length of time, and in this way assurance may be had that the pressure has been communicatod to the interior of the mass. A good illustration of the difference in the effect of the press and the hammer was given by Mr. Porter in showing sketches of two sections of a shaft, one of which had been forged down under a hammer, while the other had been worked in an hydraulic forging press. The difference in the penetrating power was apparent at the ends of the forgings. That which had been worked by the hammer was concave on the end, and the pressed section was convex. The explanation is that in the case of the hammer the blows were swiftly delivered and their effect was to change the surface, and the portions of the metal lying near to the surface, but without giving the metal time to flow which would be required in order to work it thoroughly down to the center of the piece. This lack of flowing causes internal stresses in the metal if not actual separation between the outside and the inside portions and the failure of many large forgings is attributed to this cause. In the case of the hydraulic forging press, the ideal result is more nearly accomplished wherein the greater part of the

now takes place at the center of the metal. This is the hottest portion, and consequently flows more readily than the outer parts if it is given an opportunity to do so by having the pressure kept upon it long enough. The great hammer used at the iron works referred to, a model of which was exhibited at the Columbian Exposition in 1893, is the largest in use, and it is single acting or employes steam in raising only, the blows being struck by the weight of the hammer without the aid of steam pressure. The combined weight of the piston, piston rod and hammer head is one hundred and twenty-five tons, and the stroke of the piston is sixteen and one-half feet. As this is the largest hammer in use, it may be taken as a good example of the principle spoken of by these engineers; namely, that when hammers re used theynshould act as nearly as possible like the presses and cause flowing of the whole forging rather than to act upon the outside of the material only.

THE POOLING SYSTEM FOR LOCOMOTIVES.

The subject of pooling or chain ganging locomotives was discussed at the April meeting of the Western Railway Club and the remarks which were made seem to establish two facts. First, that the members who favored assigning engines to special crews were not prepared to see that any good could possibly be obtained in the use of the pooling system; and second, that at the peesent time there is an entire absence of positive figures from which to make a satisfactory comparison between the two systems. In the discussion referred to, there seemed to be a slight misunderstanding as to the exact significance of the term "pooling," and it will probably be discovered by those who oppose this plan that they are really making use of it to good advantage in busy times and without any serious drawbacks.

The arguments against pooling are well known, but as the question is of great importance, it may be advisable to look briefly at both sides of it. It is found that the main reason for objectin to the "first in and first out" plan is that the individual trios, consisting of two men and a locomotive, and necessary in order to produce the best results as regards repairs of the engine, the efficiency of the train service and the low cost for fuel necessary for handling the business. The first of these items, the cost of repairs, has been put forward most prominently as an argument against pooling. The other two have been mentioned, and in this connection it is frequently heard that the locomotive runner must be thoroughly acquainted with his fireman, and with the method of working of the injectors. The position of the reverse lever and throttle must be equally well-known to him in order to make the whole machine run in the nearest approximation to clock work. The necessity for individual responsibility is also raised in connection with the coal records for for the reason that men are likely to throw the blame for a bad record upon the engine, or upon the fact that they have not had one engine long enough to become thoroughly acquainted with it. The matter of reporting small defects is also said to be a difficult one to attend to properly when the engines are not considered as belonging in the charge of special men, the result being that matters which should receive prompt attention are likely to be neglected and become serious before being noticed and reported.

Among the arguments upon the other side of the question are several, the most important of which may be stated as follows: This method is resorted to by all roads when the business is such that the men are unable to stay with their specially assigned engines, and when the engines must be turned rapidly in order to keep up with traffic, The point of this argument lies in the fact that no one finds the pooling system to be objectionable at such times, and in the particular discussion in question it does not appear that such a method of operating engines has been found to materially increase the cost of repairs. The question was asked by one of the members as to why the pooling system should not be equally good the year around. Another member stated that there is no question but that, aside from the care of the engine by the engineer, the fewer engines which are used to do a certain amount of work, the less the repairs will be. In connection with this it was also pointed out that with the introduction of solid end rods and metallic packing for piston rods and valve stems, that the amount of repairs given to the engine by the runner is very small, and in fact is almost nothing. Another member said: "If you can get along with 100 engines where you have previously used 200, it is economy to do it. We are discussing how to keep our engines in continuous service, and give them greater mileage."

Another point made by a transportation officer referred to the relation between the pooling system and the distribution of the men. He said: "The transportation department is not indifferent to the amount of coal used or to the condition of engines, but there comes a time when, regardless of the conditions of engines or the consumption of coal, the traffic must be moved, and it seems to me this idea which has been suggested, to give an engineer an engine, and put an extra engineer on the engine on occasions, will work very badly when business is heavy. The practical operation of this would be that the man who ought to have been left at home, and was not because he wanted to stay with his engine and earn all the money he could, finds himself very much in need of rest at some point on the road where it is very unprofitable to relieve him. It frequently happens in the rush of business that a man calls for eight or ten hours rest at a time and in a place where the transportation department can ill afford to grant it."

It was stated by Mr. J. F. Deems of the Chicago, Burlington & Quincy Railroad that in the winter of 1892, when crowded for power, he had three passenger engines operated upon certain work with six crews. He then put the six crews on one engine which was kept going for a little over two months, making in the neighborhood of 16,000 miles per month without experiencing any inconvenience, and he believed that this could have been kept up for six months had occasion required. This is certainly a remarkable mileage but instead of proving anything favorable to the cause of pooling, the instance merely shows that the experiments which are quoted are too often of insufficient duration to enable fair conclusions to be drawn from them as to the advantages of either system. The pooling system would unquestionably be the better if locomotives were like street cars in the sense that one man can handle one as well as another; if the roundhouse forces could be so organized as to keep up ordinary running repairs, and if the coal records could be individualized, that is to say, if the records could be made upon the basis of the mens' care and intelligence without introducing what are now too uncertain elements in the form of differences in the operation of locomotives. There is a tendency on many roads toward making all the engines of a class as nearly alike as possible and this should be an accompaniment of the pooling system, which if carried out to any considerable extent would cause one of the objections of the plan to lose its importance. The strongest argument for pooling lies in the continuous use of equipment from which better financial returns may fairly be expected as far as the operation is concerned. Anyone who can produce figures covering a year or two years of each system under the same conditions from which comparisons of cost of handling the traffic and of repairs may be prepared, will do a valuable work, for it is believed to be possible for the pooling system to be so administered as to give surprisingly good results.

THE ORGANIZATION OF THE CHIEF ENGINEER'S DEPARTMENT OF AN EXTENSIVE RAILWAY.*

BY WALTER KATTE. CHIEF ENGINEER N. Y. C. & H. R. R. R.

I respond with much pleasure to the invitation of your "Committee on Educational Work" to close their course on "Practical Railroading." Such a course would certainly be incomplete without including some information from the standpoint of that class of workers in the field of science and art (in their mechanical adaptations), who are justly conceded to be the creators of that most wonderful witness of the genius and power of man to cortrol, harmonize and utilize the materials, forces and laws of nature, which we see in the evolution and perfection of the modern railroad—the original germ of which, conceived and nurtured in the brain of the engineer, cared for and trained in its weak infancy with his most ceaseless and untiring solicitude, now stands forth in the vigor of full development, the most stalwart, self-sustaining and self-reliant of all the long line of the engineer's progeny. It is most fitting, therefore, that this course should include a few words to impart to you at least a general idea of the functions of the "Civil Engineer" in the working organization of a great railway system like this one in which we are fellow workers.

In the short time available for this address I cannot do more than give what may be termed a short preface and a passing word upon the chapter headings, as it were, of the general subject, leaving for future discourses a full consideration of the subject of each chapter. At the outset let me impress upon you that it is by no means my idea that this discourse, and others which may follow, shall be taken as technical lectures on the science of engineering; it would be an unprofitable use of time to address you on this occasion as I would a class of students in engineering, while on the contrary I deem it most desirable and profitable that you should be well informed and intelligently understand what is the work, duty, and functions of your co-worker, the civil engineer in our organization, and his relation to your own several avocations. Educational work in "Practical Railroading" would certainly be incomplete without it. The civil engineering department is probably the one you know least about, presumably because it has no visible connection with the movement of trains, and, therefore, scarcely ever comes under your observation in your daily work; and hence there has apparently grown around it a sort of air of mystery. No one but ourselves and our immediate superior officers, from whom we receive our instructions, seems to know exactly what it is we do, or why we are in evidence at all. To inform you in this respect, and make an effort to remove this veil of mystery is my present object, and I shall try to do so in the simplest words, and in a style that every one can fully understand. So now, to begin at the very beginning, and the surest way, in fact the only way to intelligently understand any subject is, first, to thoroughly understand and comprehend the full meaning of the words the ideas are expressed in, to accomplish which there is no plan so effective as the systematic use of a good encyclopedic dictionary, which gives in a few words, easily understood and remembered, the root derivation of words, and the ideas they were originally intended to convey. By this method you will learn that many words in common use have a broader and much more comprehensive significance than that to which they are usually restricted in our present every day use. Much valuable information may be gained in this way with very little labor. To apply this precept, let us now start with an examination of what ideas are intended to be expressed by the two words "civil engineer," and in doing so it will best serve our purpose to examine the last word first. "Engineer," rather a queer word at first glance, you may say. Let us study it a little first, and see what we can make out of it. Well, the first syllable looks all right. Engine sounds familiar enough; we all know (or think we know), what an engine is. Well, let us perform a little operation of lingual surgery and cut the tail off and set it a little further away: that makes it engine—er. Ah! now a light breaks in on us, of course there it is: Engine—er, one who runs or works an engine, which is just what it is, only we pronounce it engineer, because it is less awkward, and has a more euphonious pronunciation than engine—er. Now refer to your encyclopedic dictionary to find out exactly what the word "engine" means, and you will find that it is derived from the Latin word "*Ingenium*," defined first as innate natural quality or ability to do something and from which our common words "genius" and "ingenius" are derived; and second as an artful device or skillfully devised contrivance, plan or method. So that you see that an engine means a very great deal more than simply a mechanical device or machine; it also means a mental device or contrivance, or as stated, a "plan" or "method," as well as a mechanical machine like the locomotive engine you are all so familiar with; and used in the verb sense, "to engineer" means to promulgate and conduct a project, scheme or movement, and that is just what is the business of the civil engineer to do, namely: to skillfully or ingeniously devise methods and plans for applying the materials and forces of nature to the uses, convenience and comfort of mankind in the civil relations. Let us now look up the meaning of the first word "Civil." Turning again to our encyclopedic dictionary we find that it is also derived from the Latin, "*Civilis*," or relating to a citizen, or pertaining to the state of organized society as represented by civil government for purposes of peace, as differentiated from military, naval, or

*New York Railroad Men.

ecclesiastical government. Thus, captains, majors, colonels, generals, commanders and admirals; and deacons, priests, bishops, cardinals and popes, are, after all, simply "Engineers" of various grades in their several vocations: military, naval and ecclesiastical, the same as we are in the "Civil" vocation.

You are now, I think, prepared by understanding exactly the meaning of the word "Engineer" to see how closely allied are the two grand divisions of the work of making the railroad into which it is necessarily divided, namely, the civil and mechanical engineering, which are really the right and left legs supporting the whole body of the railroad; neither one of much use without the other. The chief officers in these departments in the organization of our company are entitled "The Chief Engineer," and the "Superintendent of Motive Power and Rolling Stock," and are necessarily "Civil" and "Mechanical" engineers in their respective departments, although it is by no means uncommon, and the history of railroad development contains many brilliant examples of both functions being most skillfully performed by the same man. This is very common in the English system of railway organization, where the general manager is often a technical expert in both civil and mechanical engineering. The two Stevensons and the well known Mr. Webb of the London & Northwestern Railway are notable examples of this in the last, and in the present generations. The harmony and interdependence of these two grand divisions of engineering science were so thoroughly recognized by Robert Stevenson that he took an occasion to record his views in the following words:

"Having been brought up originally as a mechanical engineer, and seen perhaps as much as any one of the other branches of the profession, I feel justified in insisting that the civil engineering department is best founded upon the mechanical knowledge obtained in the workshop, and the further my experience has advanced the more have I been convinced that it is necessary to educate an engineer in the workshop:—that is the education emphatically which is calculated to render the engineer most intelligent, most useful, and the fullest of resources, in times of difficulty."

Having now arrived at an intelligent idea of "what manner of man" the engineer really is, I will proceed to explain to you how he is used in the make up of the chief engineer's department of the New York Central Railroad Company, leaving for the subject of a future discourse an explanation of the technical duties and functions of the several grades and classes of engineers employed, making up the complete organization.

The organic authority for this department, like all others, is contained in the "by-laws and organization duly adopted by the board of directors of the railroad company," and is expressed in the following words:

"The chief engineer, under the direction and supervision of the third vice president, shall have the care and charge of the road bed and tracks and all buildings and structures appertaining thereto, docks, piers and bulkheads, sheds and warehouses. The ordinary maintenance of the road bed, track and structures shall be under the charge of the general roadmaster, in accordance with standard rules, regulations and plans prepared by the chief engineer and under his supervision and control."

The functions of the chief engineer's department are, therefore, necessarily duplex; first, those relating to new construction and reconstruction work; and second, those relating to the maintenance and repairs of existing work.

The first of these functions is performed by the technical engineering staff of the chief engineer, and the second by the general roadmaster and the general master builder and their assistants and the working force known as the "road department" operating under their respective supervision and control.

The technical staff of the chief engineer, as at present organized, consists of the following:

HEADQUARTERS OFFICE FORCE.

1. The "Clerical Staff."
   - 1 Chief clerk.
   - 2 Clerks, stenographers and typewriters.
   - 1 Messenger.
   - 1 Blue-printer and general utility.
2. The "Engineering Staff."
   - 1 Chief Assistant Engineer and acting as resident engineer of Hudson & Mohawk divisions from 72d street to DeWitt, M. & M. R. R., West Shore east of DeWitt and N. J. J. R. R.

Bridge and Metallic Structure Department.

- 1 Assistant Engineer.
- 3 Draftsmen.
- 1 Inspector of Bridges.

Architectural Department.

- 1 Assistant Engineer Architect in charge.
- 2 Draftsmen.
- 1 Inspector.

3. The "Field Force."

Hudson and Mohawk divisions and their branches east of DeWitt, including the M. & M. R. R. and N. J. J. and W. V. R. roads.

- 2 Assistant Engineers.
- 3 Rodmen.
- 3 Chainmen.
- 1 Draftsman.
- 1 Inspector.

New York City Division.

Hudson division, south of 72d street

Harlem division, Grand Central depot to Chatham and Pt. M. Br. S. D. & Pt. M. Br. Mott Haven Junction to Spuyten Duyvil Junction, Mahopac Br., New York & Putnam R. R. 155th street to Brewsters.

- 1 Resident Engineer.
- 2 Assistant Engineers.
- 3 Rodmen.
- 2 Chainmen.
- 1 Inspector.
- 1 Clerk to Resident Engineer.
- 1 Cement tester.
- 1 Assistant tester.

Western division and all branches, including W. S. R. R. and branches west of De Witt. Office at Rochester.

- 1 Resident Engineer.
- 1 Assistant Engineer.
- 1 Assistant Engineer and Draftsman.
- 3 Chainmen.
- 1 Inspector.
- 1 Clerk to Resident Engineer.

Special Forces on New Construction Work.

1, New York "Park Avenue Improvement:"
- 1 Chief Assistant Engineer.
- 2 Assistant Engineers (1 field and construction, 1 metal structure).
- 1 Instrumental Assistant.
- 2 Rodmen.
- 2 Chainmen.
- 2 Draftsmen.
- 1 Inspector.

2, Buffalo "Grade Crossing Improvement:"
- 1 Assistant Engineer.
- 1 Instrumental Assistant.
- 1 Rodman.
- 1 Chainman.
- 1 Inspector.

SUMMARY.

Permanent Force:

- 1 Chief Assistant Engineer.
- 2 Resident Engineers.
- 7 Assistant Engineers.
- 5 Rodmen.
- 8 Chainmen.
- 5 Inspectors.
- 7 Draftsmen.
- 1 Chief Clerk.
- 6 Clerks.
- 2 Cement Testers.

Total, 45

Special force (Temporary):

- 5 Assistant Engineers.
- 3 Rodmen.
- 3 Chainmen.
- 2 Inspectors.
- 2 Draftsmen.

Total, 15 — 15

Total, - - - - - - 60 men.

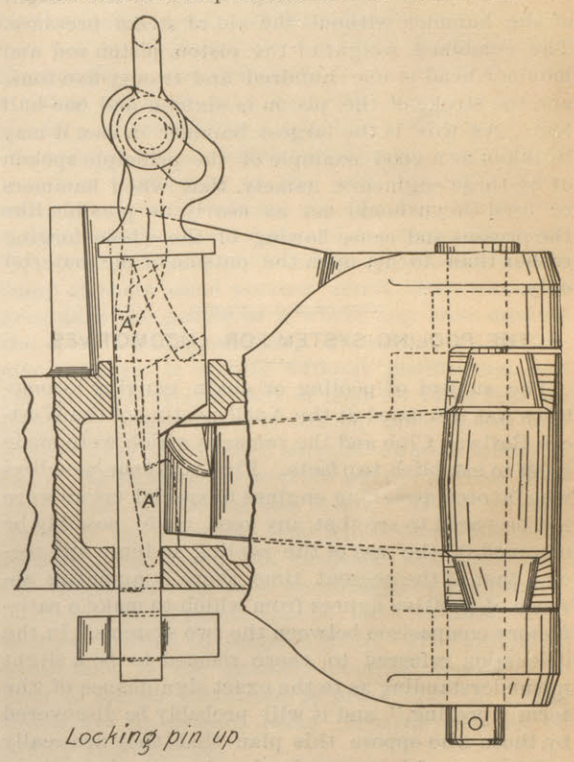
The "Oriole" is the title of a publication which is now being issued monthly by the Baltimore Steam Packet Co. It is unusually well illustrated, contains a large amount of matter specially interesting to the traveling public as well as the general reader, and it is needless to state refers chiefly to the advantages of the Bay Line route, which has been famous for its attractions to travelers for so many years. One of the features of the "Oriole" during the next few months will be the matter devoted to sporting topics and it may be said that the publication, like the bird from which it is named, will "fly high".

The Great Northern Railway Company (of England) is contemplating spending $1,250,000 in relaying their fast roads with steel rails weighing 90 lb. to the yard. This is said to be the outcome of the Board of Trade Inspector's report on the railway accident at St. Neots in November last, when it was strongly recommended that steel rails should be used for all the express service tracks.

NEW LOCKING PIN FOR JANNEY COUPLER.

A new locking pin has been designed and introduced by the McConway & Torley Co., which constitutes an improvement over the one which has been in use in the Janney couplers. The new features in the locking pin consists of an automatic trip, shown at A in the illustrations, which are taken from the drawings.

The automatic trip is intended to obviate the necessity of locking up the uncoupling lever when switching cars. When the pin is raised to the unlocking position it is held there until the tail of the knuckle travels in or out. The knuckle will lock in the act of coupling, whether the pin is up or down in the locking position. If the pin is in the elevated position and for any reason it is desired to drop it to the locking position without cutting the train, it may be dropped into the locking position by simply striking an upward blow on its lower end.



NEW LOCKING PIN FOR JANNEY COUPLER.

Western Society of Engineers.

A regular meeting (the 344th) of the society was held in the society's rooms May 6, 1896, at 8 p. m., First Vice President Thos. T. Johnston in the chair. There were 37 members and guests present. The minutes of the previous meeting were read and approved.

The chairman of the entertainment committee stated that arrangements were being made for an excursion to South Chicago to visit the works of the Illinois Steel Co., notice to be sent to all members in due time.

The secretary announced the appointment, by President Wallace, of Messrs. Edgar Williams and John Ericson as a committee to act with the Illinois Society in the matter of sanitary legislation.

The secretary was instructed to express the thanks of the society to the proper official who extended an invitation to this society to attend the Mining and Geological Millenial-Congress, to be held at Budapest, Hungary, September 25 and 26, 1896.

Report for the board of directors was made by the sec-

retary, as follows: At a meeting held April 17, applications for active membership were received from Dabney H. Maurey, Jr., James S. Stephens and Edward J. Murphy.

Charles F. Foster was declared elected as an active member.

At a meeting held April 21, applications for active membership were received from Frank Bankson Rae and William J. Buckley. The resignation of J. G. Pearson was accepted, to date December 31, 1895. At meeting held May 5, applications for active membership were received from Edward M. Herr and Gustav Vogelsberger.

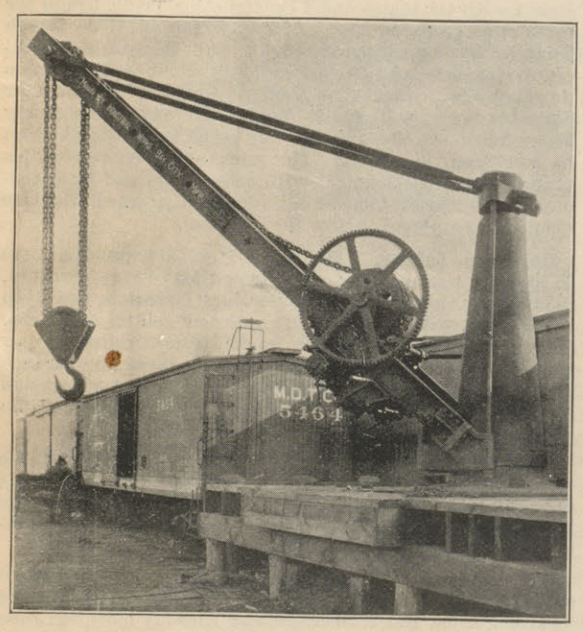
The following were declared elected to active membership: Julian Switzer Hull and Frederick Henry Dose.

Owing to the small number visiting the society rooms in the evening it was decided to close them at 5:30 p. m. hereafter.

A very interesting paper on the subject of "Foundations" was read by Mr. George E. Thomas, which evoked considerable discussion of a profitable character. The paper and discussion in full will be printed in the June issue of the Journal.

THIRTY TON CAPACITY RAILROAD YARD PILLAR CRANE.

The accompanying illustration shows a recent design of large capacity pillar crane manufactured for the Michigan Central Railroad freight station at Chicago, Ill., by the Industrial Works of Bay City, Michigan. In this machine, on account of the large weights necessary to be hoisted and swung by hand, careful attention has been given to the reduction of friction in all of the working parts. All of the bearings carrying loads are provided with hard steel roller bushings, and the crane may be operated very easily with light loads by two men. The hoisting



mechanism consists of an accurately running train of steel and iron gearing provided with self-sustaining brakes and ratchets. There are two speeds of hoist for light and heavy loads. The base and pillar are cast in one piece, and the crane is mounted upon and anchored to a very substantial masonry foundation which is concealed by the platform and is therefore not shown in the illustration. Cranes of this and the transfer type in capacities from five to thirty tons are built at these works.

TECHNICAL MEETINGS.

International Association Car Accountants, June 9, Cleveland, Ohio.

Annual convention Master Car Builders' Association June 17, Saratoga, New York.

Annual convention American Master Mechanics' Association, June 22, Saratoga, New York.

Association American Railway Accounting Officers, May 27, New York City.

Association Railway Telegraph Superintendents, June 17, Fortress Monroe, Va.

American Association General Baggage Agents, July 15, Philadelphia, Pa.

The American Society of Civil Engineers holds meetings on the first and third Wednesdays in each month, at 8 p.m., at the House of the Society, 127 East Twenty-third street New York City.

The Association of Civil Engineers of Cornell University meets weekly every Friday, from October to May inclusive, at 2:30 p. m., at Lincoln Hall, New York.

The Boston Society of Civil Engineers, meets monthly on the third Wednesday in each month, at 7:30 p. m., at Wesleyan Hall, 36 Bromfield street, Boston, Mass.

The Canadian Society of Civil Engineers meets every other Thursday at 8 p. m., at 112 Mansfield street, Montreal, P. Q.

The Foundrymen's Association meets monthly on the first Wednesday of each month, at the Manufacturers' Club, Philadelphia, Pa.

The International Irrigation Congress will hold its fourth session at Albuquerque, N. M., September 16-19. Fred L. Alles, secretary, Los Angeles, Cal.; local secretary, W. C. Hadley, E M., Albuquerque, N. M.

The Montana Society of Civil Engineers meets monthly on the third Saturday in each mouth, at 7:30 p. m., at Helena, Mont.

The New England Railroad Club meets on the second Tuesday of each month, at Wesleyan Hall, Bromfield street, Boston, Mass.

The New York Railroad Club has a monthly meeting on the third Thursday in each month, at 8 p. m., at 12 West hirty-first street, New York City.

The Northwestern Track and Bridge Association meets on the Friday following the second Wednesday of March, June, September and December, at 2:30 p. m., at the St. Paul Union Station, St. Paul, Minn.

North-West Railway Club meets alternately at the West Hotel, Minneapolis, and the Ryan House, St. Paul, on the second Tuesday of each month.

The Engineering Association of the South meets on the second Thursday of each month at 8 p. m., at the Cumber land Publishing House, Nashville, Tenn.

Annual meeting Traveling Engineers' Association, Minneapolis, Minn., Sep. 8, 1896. W. O. Thompson, secretary 415 Marion street, Elkhart, Ind.

Annual Convention Roadmasters' Association and Road and Track Supply Association, Cataract Hotel, Niagara Falls, N. Y. second Tuesday in September, 1896.

The Railway Signaling Club holds its meetings in Chicago, Ill., on the second Tuesday of January, March, May, September and November. G. M. Basford, secretary, 818 The Rookery.

The Southwestern Society of Mining Engineers will hold a session at Albuquerque, N. M., September 16-19. Walter C. Hadley, secretary, Albuquerque, N. M.

The Southern & Southwestern Railway Club holds its meetings on the third Thursday of January, April, August and November, at the Kimball House, Atlanta, Ga.

The Western Foundrymen's Association holds its meet ings on the third Wednesday in each month, at the Great Northern Hotel, Chicago, Ill.; secretary, S. T. Johnstone, 1522 Monadnock building.

The Technical Society of the Pacific Coast has a month y meeting on the first Friday in each month at 8 p. m., at the Academy of Sciences building, 819 Market street, San Francisco, Cal.

The Engineers' Club of Cincinnati has a monthly meeting on the third Thursday in each month, at 7:30 p. m. at the Literary Club, 24 West Fourth street, Cincinnati, O. Address P. O. Box 333.

The Engineers' Club of Minneapolis holds its meetings on the first Thursday in each month, at Public Library building, Minneapolis, Minn.

The Engineers' Club of Philadelphia meets on the first and third Saturdays in each month, at 8 p. m., at the house of the club, 1122 Girard street, Philadelphia, Pa.

The Civil Engineers' Club of Cleveland, meets on the second and fourth Tuesdays in each month, at 8 p. m., at the Case Library building, Cleveland, Ohio.

The Association of Engineers of Virginia, holds its informal meetings on the third Wednesday of each month from September to May inclusive, at 8 p. m., at 710 Terry building, Roanoke, Va.

The American Society of Irrigation Engineers. Third annual meeting will be held at Albuquerque, N. M., September 16-19. John L. Titcomb, secretary, 36 Jacobson block, Denver, Col.

The Western Railway Club of Chicago, holds its meeting on the third Tuesday of each month.

The Central Railway Club meets on the fourth Wednesday of January, March, April, September and October, at 10 a. m., at the Hotel Iroquois, Buffalo, N. Y.

The Denver Society of Civil Engineers meets on the second and fourth Tuesdays in each month except July, August and December, when they are held on the second Tuesday only, at 36 Jacobson building, Denver, Colo.

The Western Society of Engineers holds its regular meetings for the transaction of business and the reading and discussion of papers on the first Wednesday of each month except January.

PERSONAL.

According to official circular Mr. John W. Skeele is appointed special agent of the Lehigh Valley Railroad, with office in Western Union Building, Chicago.

Mr. F. S. Way, general storekeeper of the Louisville, Evansville & St. Louis Railroad, retired June 1. His office has been placed in charge of Master Mechanic J. S. Sechler.

Mr. Arthur G. Craig, division freight agent of the Alabama Great Southern, at Birmingham, has resigned that office and his successor will be Mr. T. F. Steele, of the Walker County Coal Association, an old freight man.

Mr. John Byrne, general passenger agent of the Southern California, has been appointed auditor of that road to succeed Mr. H. C. Whitehead, recently appointed auditor of the Santa Fe. Mr. Byrne will discharge the duties of both offices.

Mr. R. H. Aishton has been appointed superintendent of the Northern Iowa division of the Chicago & Northwestern, with headquarters at Eagle Grove, Iowa. Mr. W. H. Graves has been appointed assistant superintendent to succeed Mr. Aishton.

Mr. W. H. Tumy has been appointed agent of the Central States Dispatch, fast freight line, with office at Fourth and Vine streets, Cincinnati, Ohio, vice Mr. C. W. Tomlinson, general agent, resigned to accept service elsewhere. Appointment effective June 1.

Mr. Chas. Townsend, for six years general agent for the Baltimore & Ohio at Toledo, has resigned the general agency of the Baltimore & Ohio Southwestern at Cincinnati, to accept the secretaryship of the National Guarantee Company, with headquarters at Kansas City.

Mr. John Horgan, assistant trainmaster for the Lake Shore at Toledo, has been appointed trainmaster for the same company, with headquarters at Westfield. Mr. Horgan has been connected with the Lake Shore at Toledo for about fifteen years, first as train dispatcher and later as assistant trainmaster.

Mr. Chas. C. Mordaugh, who a few weeks ago resigned as traveling passenger agent of the Chicago, Milwaukee & St. Paul, to engage in commercial pursuits, has returned to the service of the St. Paul as traveling freight and passenger agent, with headquarters at La Cross, Wis. For years he traveled with headquarters at Indianapolis.

It is stated in the Boston & Maine Courier that Mr. Timothy Canty, one of the oldest employes on the Boston & Maine Railroad, having been connected with that corporation 56 years, resigned May 9. He has lived in Reading, Mass., for 50 years and had charge of the section between Reading and Wakefield. Mr. Canty is 80 years of age.

A number of transfers have been made in the forces of the Illinois Central, Mr. Doul, commercial agent has changed his office from Louisville to Pittsburgh, where he displaces Mr. A. H. Harwood. Mr. Harwood goes to Cincinnati, where he assumas the duties of Mr. E. M. Downing, who is now made traveling passenger agent of the Illinois Central from that point.

Mr. Harry H. Rogers, who has been with the Cleveland & Buffalo Transit Company since its start, and also general agent at the Soo for four years, is appointed to the position of commercial freight agent of the Baltimore & Ohio system. It is said that the Cleveland freight agency is considered one of the strongest in the system and that Mr. Rogers will be the right man for the place.

Mr. R. S. Greenwood, for the past eleven years, connected with the Ann Arbor road, has accepted the position of Michigan passenger agent for the Wabash. He succeeds John R. Green, who has resigned. Mr. Greenwood's successor on the Ann Arbor has not been named, but E. S. Gilmore has received favorable mention. Mr. Greenwood's appointment takes effect July 1.

Mr. C. Haile has resigned as general freight agent of the Missouri, Kansas & Texas Railway, and that position has been abolished. The business of the freight department will be looked after entirely until further notice by Traffic Manager D. Miller. Mr. Haile will become a member of the board of administration of the Southwestern Traffic Association, representing M., K. & T. interests on the board.

Mr. J. W. Coneys, general yardmaster at Cincinnati, has been installed as trainmaster of the Richmond division of the Pennsylvania Railroad, with headquarters at Richmond. He succeeds Mr. Harry N. May, who was promoted to trainmaster of the Chicago division, with headquarters at Logansport. Mr. Coneys has been with the Pennsylvania for twenty years, twelve years at Cincinnati and eight years at Columbus, O.

Mr. J. H. Barrett, at one time general superintendent and purchasing agent of the Cleveland, Akron & Columbus, has received an appointment to the superintendency of four hundred miles of the Southern Railway system. In addition to the superintendency of the indicated section, Mr. Barrett is to have charge of all the terminals at Atlanta. As Atlanta is the gateway for business north, south, east and west, this is the most important point in the system.

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Announcement is made of the promotion of Division Superintendent S. S. Hand of the Lake Shore & Michigan Southern road, to the position of general agent, with headquarters in Detroit. He will be succeeded as division superintendent by H. J. Worcester, who will go to Detroit from the Lansing division. Train Dispatcher M. L. Reynolds succeeds Mr. Worcester as superintendent of the Lansing division, while Mr. Sidney Hand, who has been with the Lake Shore since 1860, has been appointed general agent of the company at Detroit.

At a meeting of the board of directors of the Cleveland, Cincinnati, Chicago & St. Louis road held on May 28 in New York City, Mr. F. D. Comstock, treasurer of the Big Four, and the assistant treasurer, now located in Cincinnati, resigned their positions, and the board elected Mr. C. F. Fox treasurer, and Mr. Frederick Middlebrook assistant treasurer, with offices at the Grand Central depot, New York City. Mr. Comstock was then elected local treasurer at Cincinnati. The change was made in order that the finances of the C. C. C. & St. L. could be managed in New York, it greatly simplying the methods of handling the Big Four financial matters.

The following changes on the Maine Central went into effect June 1. Mr. H. F. Dowst has been appointed division superintendent of the lines of the Maine Central company east of Bangor, and his authority will extend over all station agents and train men east of Bangor. He will

continue to act as heretofore as the company's agent in Bangor. Mr. J. L. Speer is appointed chief train dispatcher with headquarters at Portland,and all of the company's lines west of Bangor will be under his charge. Mr. M. F. Dunn is appointed chief train dispatcher at Bangor with charge over all lines east of Bangor, including main line and branches, and will report to Mr. H. F. Dowst, division superintendent.

Official announcement has been received of the appointment, effective June 1, of Mr. J. E. Hannegan as assistant general passenger agent of the Cleveland, Akron & Columbus Railroad Co., with office at Cleveland. The position formerly held by Mr. Hannegan was that of chief clerk of the C. A. & C. railroad, his promotion to this office being made when Mr. C. F. Daly became general passenger agent of the road. The valuable service rendered by Mr. Hannegan while acting in the capacity of chief clerk called forth a prediction that promotion to his present position as general passenger agent would be made. Mr. Hannegan is well known among railroad men.

Several changes have been made in the freight department of the Great Northern. Mr. John C. Eden has been appointed general freight agent of the Eastern Minnesota, vice Mr. George O. Summers, who will hereafter devote all his time to the business of the Great Northern. Mr. H. C. McMicken, who has had charge of the Eastern business, has been promoted to be general agent of the read at Toronto. Mr. Archibald Grey, who has been assistant general freight agent for several years and has had charge of all Western freight business, has had his headquarters changed to Butte, Monte. Mr. Grey will be in fact general freight agent of the Montana Central. He will still retain his title of assistant general freight agent, but will have entire charge of the freight department of the Montana Central.

Mr. George T. Jarvis, receiver of the Louisville, Evansville & St. Louis Railroad, has issued the following circular, giving changes, effective at once: The offices of general superintendent, general roadmaster and master car builder are abolished: Mr. J. R. Sample, appointed superintendent, in charge of the transportation department, office at Princeton. Mr. T. A. Allen, chief engineer, assumes charge of the maintenance of way department, in addition to his present duties; office at Evansville. Mr. J. F. Sechler, master mechanic, assumes charge of the car department, in addition to his present duties; office at Princeton. Mr. C. W. McGuire, auditor, also appointed car accountant, vice Mr. J. C. Dierking, resigned; office at Evansville. Mr. A. R. Candy appointed storekeeper, vice Mr.F.S.Way, resigned; office at Princeton. Mr.J.S. Wright appointed treasurer, vice Mr. E. M. Heberd, resigned to accept other service; office at Evansville.

Mr. Austin Corbin, the railway magnate of New York City, was fatally injured in a runaway on the afternoon of June 4, and died the same evening without having recovered consciousness after the accident. Austin Corbin, who has often been called the king of Long Island, was born in Newport, N. H., July 11, 1827. He was graduated at Harvard law school in 1849, and after practicing law at Newport for awhile, in 1851 he removed to Davenport, Ia., where he lived 14 years. It was while there that he entered the banking business with a success that was followed by others of greater magnitude. In 1865 he went to New York, and started the banking house Austin Corbin & Co., which continued the mortgage business that Mr. Corbin had started. Soon after 1865 he became interested in railroads. On his first trip to Long Island, he saw the natural advantages and understood that the island must become an outing place for millions in the near-by cities. At that time the Long Island roads were isolated systems, badly managed and in constant financial difficulties. After securing the control of the principal line, Mr. Corbin's one thought was to develop a great system which should bring all roads on the island under the one management. This ambition he attained in the early part of this year, when he became the owner of the majority interest in the one system which now controls transportation of the island. He built the first railway from Brooklyn to Coney Island, and it was through his instrumentality the first of the large hotels were erected there. In addition to his large railroad interests as president of the Long Island Railway system and his administration of the affairs of the Philadelphia & Reading Railroad during a difficult period of its existence, Mr. Corbin found time to put in operation many financial schemes, philanthropic plans of colonization and emigration. Mr. Corbin was a man of remarkable physique. He being six feet tall, broad shouldered, and weighed more than 200 pounds.

RAILWAY NEWS.

Baltimore & Ohio.—On June 1, Judge Goff signed an order approving the form of receiver's certificates to be issued upon the petition of Receivers Cowen and Murray. The petition states that the receivers of the Baltimore & have arranged with several banking houses to undertake the sale at par of certificates, and that in such negotiations it has been agreed that the certificates shall be issued payable to the Mercantile Trust Co. or bearer, in the following amounts: Four hnndred for $10,000 each, 160 for $5,000 each, and 200 for $1,000 each. Each certificate will bear interest warrants corresponding to the respective semi-annual payments of interest. It has been further agreed that the certificates should be redeemable on June 1, 1897, or any interest day thereafter, at the option of the court or receivers, upon 30 days' notice by advertisement in two daily newspapers of New York city. The receivers are in no way individually liable upon the certificates, but under the decree of the court the certificates of this series constitute until paid the first and paramount lien on the entire main line of the railroad and branches, bridges, terminals, equipment, and franchises of the company, and on all the company's leasehold estate and rights in other railroads now in charge of the receivers, and on all the earnings and income of the company from its entire system of railroads under the management of the receivers, next after operating expenses and court costs. The salary of the receivers has been fixed by the court at $2,300 per month.

Calumet & Blue Island.—The Calumet & Blue Island Railway Co. has given a trust deed to the Merchants' Loan & Trust Co., for $2,500,000 to secure bonds for $5,510,000. Existing mortgages for $1,310,000 will be retired, and $1,200,000 will be paid for the stock of the Chicago, Lake Shore & Eastern Railway Co. Any balance will be spent in improving existing lines. The deed covers the right of way, appurtenances and stock. This action is the result of the directors' decision, March 31 last, to issue 251 bonds for $10,000 each. The bonds are dated April 1, 1896, are payable in gold April 1, 1916, 6 per cent interest being payable semi-annually.

Central Vermont.—On May 29 Judge Wheeler in the United States circuit court heard the case of the Grand Trunk R. v. the Central Vermont R. Co. Mr. Swayne of New York for Mr. Parsons of New York, the owner of the bonds of the Ogdensburg & Lake Champlain R., asked that the net earnings of the road be set aside to meet the interest on the bonds shortly to become due. What appeared to be a satisfactory settlement was reached on the following basis or proposition: The net earnings of the Ogdensburg shall be computed in accordance with the terms of the lease; the receivers shall set apart as a separate fund all of the net earnings of that road since it came into their hands on March 20, to be used in the payment of the interest on these bonds under the direction of the court, and the receivers from the books of the company shall prepare a statement of all the net earnings of the road since October 1, 1895, the date on which the present unpaid interest began to accrue. Some petitions of small moment, with reference to the paying of certain indebtedness for repairs and for incidental expenses were allowed without objection. As to the petition of the American Loan & Trust Co. and the National Bank of Redempton, for a correction or modification of the original order, such modifications were made so as to prevent the payment of any moneys by the receivers for supplies and traffic balances without an order of the court. The decision of the court was that nothing should be paid on any preferred debts until there had been a list of claims filed by the receivers, and an order of the court. The receivers asked authority to buy bridges, ties, steel rails and cars, and the order granted it.

Cedar Falls & Minnesota.—The Cedar Falls & Minnesota road was sold at Waverly, Iowa, on June 1, and was bid in by John S. Hanna of Chicago for $600,000. Hanna acted for the stockholders of the Illinois Central R., who held 90 per cent of the $1,377,000 of the mortgage bonds against the road to satisfy the interest due on which the execution and sale was made. Those bonds were produced in court by Hanna and accepted as part of the purchase price.

Cheraw & Chester.—The Cheraw & Chester R., running from Chester to Lancaster, S. C., 30 miles long, narrow gage, was to be sold at Chester, S. C., May 1, under foreclosure proceedings instituted by the holders of $100,000 first mortgage bonds, but the sale was postponed until the first Monday in June by request of bondholders. The probable bidders are Ohio River & Charleston R. and the first mortgage bondholders' committee and a Lancaster,S. C., syndicate. The road has been in the hands of a receiver since December, 1893, and owing to heavy complication, has not a very large earning capacity.

Chester & Lenoir.—The Chester & Lenoir R., which we mentioned in February as having gone into the hands of a receiver to further the reorganizatioa plans, will probably be sold this fall, as we understand the reorganization is progressing very well and the road continues to show an increase in earnings. The large addition of rolling stock this year has greatly aided this road in increasing its business. It expects a large passenger business to the mountain resorts this season and has quickened its schedules and added to its passenger train service chair cars of original and comfortable design. This road is among the progressive and successful of the now few narrow gages of the country.

Chicago, Rock Island & Pacific.—The annual meeting of the Chicago Rock Island & Pacific R. Co. was held at the office of the company, in Chicago, at 11 a. m. on the third instant, at which of the entire capital stock (461,560 shares) 314,247 shares were represented in person or by proxy. Mr. F. H. Griggs of Davenport, Iowa, was elected a director to succeed the late Judge George G. Wright of Des Moines, Iowa, and all directors whose term of office expired at this meeting were re-elected. The board of directors as now organized as follows: Hon. R. P. Flower; Benjamin Brewster; H. R. Bishop; Henry M. Flagler; Alexander E. Orr; David Dows, Jr. and Alex T. Van Nest, of New York. H. H. Porter; Marshall Field; John DeKoven; R. R. Cable; W. G. Purdy; of Chicago, and F. H. Griggs, of Davenport, Iowa, After the adjournment of the stockholders meeting, the board of directors held a meeting, and elected officers for the ensuing year, as follows: R. R. Cable, president; Benj. Brewster, first vice president; W. G. Purdy, second vice president, treasurer and secretary; W. H. Truesdale, third vice president. Geo. T. Boggs was reappointed assistant treasurer and assistant secretary, at New York. J. F. Phillips, assistant treasurer and assistant secretary, at Chicago and C. F. Jilson, assistant treasurer, at Topeka, Kansas. The following members of the board were elected by the directors as an executive committee, to serve during the ensuing year; R. R. Cable, Benjamin Brewster, H. R. Bishop, H. H. Porter, and Marshall Field.

At this meeting the sixteenth annual report was presented by the directors to the stockholders, and the statement for the year ending March 31, 1896, shows: Gross earnings, $17,359,653, of which $4,445,952 was passenger and $11,159,100 freight, a decrease of $61,163; operating expenses, $10,977,231, a deerease of $868,046; taxes, $889,272; net earnings, $5,493,059, an increase of $754,504. Total number of passengers carried increased 520,279; freight tonnage increased 167,417 tons.

Denison & Northern.—It is now considered a settled fact that the Denison & Northern R. will be built by the parties having it in hand. Judge Kilgore, from whose court the order was issued to allow the promotors of the line to issue certificates of indebtedness to raise money to push the building of the line, secured the services of J. W. Wilson, a civil engineer of international repute, and had him go over the line of the road as it is proposed in the charter, and make estimates of the cost of building and equipping the line, gather data as to the topography of the country, the value of the line and the probability of its being profitably operated when built; to examine the character of the work being done by the construction company and to make an exhaustive and complete report of the whole situation, so that he would be able to pass upon the value of the certificates. This was done by Mr. Wilson and the report was very satisfactory in every respect. It shows that the proposed line passes through the richest mineral belt in the west; that it can be profitably operated; that the work being done is of thoroughly substantial character and that the construction company has sufficient means, teams, men and facilities to push it through to completion. It shows that there are twenty-one miles of the road graded and bridged and fifteen miles of steel down and forty-five miles of the right of way cleared. Frank Davis, a contractor who had a grading contract with the Texas & Pacific when it was built into Denison, arrived in that city on the morning of June 1 with ten teams and a construction outfit, bound for Pendleton creek in the Chickasaw nation, from which point he has a grading contract on the Denison & Northern to Coalgate, and from Pendleton creek to Denison on the same line. Davis has been at work 70 miles below Shreveport on the Texas & Pacific. He was at Dougherty last week to see those having the building of the Denison & Northern in charge. He reports twenty-five miles graded and a portion of it with rails down, and by Saturday night he said forty miles of road toward Denison would be completed, ready for the steel.

Galveston, LaPorte & Houston.—The Galveston, LaPorte & Houston road was formally opened May 12 to Galveston, making the third railroad connecting Galveston, the deep water port, with Houston, the railroad center, of Texas. This new route is 55 miles in length, being about two miles longer than the present lines. It has secured an entrance to Houston via the Southern Pacific's terminal system and will be in good position to handle both freight and traffic business.

Grand Rapids & Indiana.—The date of the sale of the Grand Rapids & Indiana has been set for June 10. It is thought in some quarters that it will be bought in by the Pennsylvania people and operated very much as the Vandalia line is now.

Lima Northern.—Tracklayers on this new line have crossed the Michigan state line. Regular train service between Lima and Wauseon began Tuesday morning, June 2. Connection will be made at Wauseon with the Lake Shore for Chicago and Toledo. The present terminus of the road, as projected, will be Detroit Junction, a station four miles west of Detroit, on the Lake Shore road. The trains of the Lima Northern will run into Detroit over the tracks of the Lake Shore & Michigan Southern.

Louisville Henderson & St. Louis.—On May 30, Attorney Helm filed articles of incorporation with the secretary of state at Frankfort, Ky., to organize the Louisville,St.Louis & Texas railway, now in the hands of a receiver, under the name of the Louisville, Henderson & St. Louis railway. At a meeting of the board of direcors held later at the office of the Columbia Trust company, in Louisville, the following officers were elected: President, Colonel Attila Cox; vice president, Harry Weissinger; secretary, Edward M. Post, of New York; treasurer, H. V. Sanders. It is expected that the new company will be in good working order in a week's time. The capital stock is $4,000,000, of which $2,000,000 is 5 per cent non-cumulative preferred stock.

Port Royal & Augusta.—Messrs. Samuel Thomas and Thomas F. Ryan have purchased the better part of the first mortgage bonds of the Port Royal & Augusta Railroad, and will reorganize the property. It has been reported that after the reorganization the road would be leased to the Central of Georgia, but this, under the constitution of the state of South Carolina cannot be done, and it will be operated in the South Carolina system. The Central of Georgia is a part owner of the stock and general mortgage bonds of the Port Royal & Augusta. The chief value of the line, which is 112 miles in length, is supposed to be its terminal at Port Royal.

Southern.—It is reported that the Southern will lay another track, parallel with the present one, between Greensboro and Salisbury, N. C., a distance of about fifty miles. The additional track is made necessary by the remarkable increase in traffic, both passenger and freight, especially the latter, between those points, Greensboro being the junction of three divisions of the North Carolina Railroad, and on the main line, and Salisbury being the connecting point between the old main line and the new through line established between Norfolk, Va., and Memphis, Tenn.

Southern Pacific.—The San Francisco Bulletin says that the Southern Pacific Ry. will soon undertake some ex-

tensive improvements on the Alameda narrow gage mole. Within a few weeks, or as soon as the mud pumped from the estuary has settled into a hard foundation about the narrow gage trestle, the timbers which now support the track will be removed and the roadbed will be built upon hard ground. At present the filling does not reach to the level of the rails, and a number of thousand cubic yards of rock and gravel will be used to build up the roadbed to the proper hight. This will make a solid and substantial roadbed for a distance of 6,000 feet from the shore. No plan has as yet been devised for filling in the 2,000 feet of trestle between the west end of the embankment and the pier.

Toronto, Hamilton & Buffalo.—The contract for the construction of the spur to connect the Toronto, Hamilton & Buffalo R. with the Toronto branch of the Grand Trunk R., has been awarded to Mr. M. A. Pigott of Buffalo. He has secured all the plant he will require and the work will be rushed from start to finish. Ground will be first broken on the big cutting between the old Catholic cemetery and the Hamilton cemetery. The cuttings will be for the most part through hard pan of the hardest description, and a great deal of blasting will have to be done. The limited time for the completion of the work—four months—will make the employment of an unusually large number of men a necessity. The cost of the work will be over $250,000.

Washington & Idaho.—A decree of foreclosure has been signed by Judge Hanford on the mortgage held by the Bay State Trust Co. on the Washington & Idaho R., and ordering the sale of the entire property of the road. The mortgage was dated September 2, 1889, and the entire amount of indebtedness $2,277,873. The decree appoints Wellington M. Clark special attorney to conduct the sale, which is to take place at Tekoa, Wash. Bonds arising from the sale are to be applied in the following order: First, to expenses of sale; second, costs of the suit and attorney's fees; third, the indebtedness of every kind of Edwin McNeill, receiver of the Oregon R. & Navigation Company, and of the Washington & Idaho Railway Company which may be ordered by decree of court; fourth, the bonds and coupons of the Washington & Idaho R. Co. secured by the mortgage with interest, or if the proceeds be not sufficient to pay this fourth item, the rest to be divided pro-rata.

NEW ROADS AND PROJECTS.

Africa.—It is said to be practically settled that the new railway, which will penetrate into the interior, is intended to be worked largely in conjunction with English enterprise for the development of Central Africa. A number of preliminary surveys have already been sent to London from Brussels, and over and above the loan of 10,000,000 francs, which the Belgian Chamber has agreed to guarantee, a further loan of 15,000,000 francs will be guaranteed after a line has been commenced. With the coming of the King of the Belgians to London early in June, it is expected that plans and details will be definitely arranged.

Pennsylvania.—It is now thought that the South Penn road will be built, but it is not expected this year will see it done. An official of the Pennsylvania R. is quoted in an eastern paper as follows: "The resurveys of the route, now being made by Cumberland Valley engineers, are for the purpose of perfecting our right of way, so that when we decide to go ahead with the road and complete it there will be nothing to delay us. No time has been fixed on for the resumption of work, but I don't suppose that it will be many years before we find that we can make use of another line across the state to great advantage." As originally projected, the South South Penn R. was to extend from Pittsburgh, where it had the backing of Andrew Carnegie and other large manufacturers, to Harrisburg, where it was to connect with the Reading R. The financial sponsors for the road were the Vanderbilts, who, it is understood, in revenge for the support given by the Pennsylvania R. to the unnecessary paralleling of the New York Central by the West Shore road, started South Penn & Beech Creek roads, both of which were projected into the very heart of the Pennsylvania territory. A truce was declared after the Vanderbilts and Pittsburgh manufacturers had spent $5,000,000 on the South Penn, but it came too late to prevent the construction of the Beech Creek R., which has ever remained a thorn in the side of the Pennsylvania people, giving the Vanderbilts access to the rich Clearfield coal fields. In taking up the work of finishing the South Penn it is understood that the Pennsylvania R., which bought the line from the Vanderbilts, intend to complete only a portion of it. This will probably be from Newville, on the Cumberland Valley road, to Mt. Dallas, the northern terminus of the Pennsylvania's Bedford division. By the construction of this new stretch of railroad the Pennsylvania would secure a connection with its Bedford division, which is now isloated from the rest of the system, and would secure for its own lines the entire haul of the West Virginia coal, which now passes from Mount Dallas to Huntingdon over the tracks of the Huntingdon & Broad Top Railroad. It is thought doubtful if the South Penn will ever be built beyond Mt. Dallas, at least, not for many years. Most of the expensive tunnel work, on which so much money was spent, is between Newville and Mt. Dallas, and the cost of finishing this portion of the road will not be very heavy.

It is currently reported that a company, with Mr. H. C. Frick as controlling factor, will invest $1,000,000 in the building of a new line from the Frick coke plant in the Youghiogheny Valley to a connection with the Union road of the Carnegie Steel Co. at Duquesne, which will be called the Youghiogheny Southern. It is said that about five years ago $3,000 was spent in securing the right of way and making a preliminary survey from the junction opposite Broadford with the Pemicky, taking in Trotter, Leisenring No. 1, with a terminus at Leisenring No. 2. The survey was continued into Uniontown and right of way secured, but the whole scheme was dropped. The object at that time was apparently to get better facilities for coke freight. The road was chartered as the Youghiogheny Southern, and the charter owned by a company headed by H. C. Frick. Recently the charter expired and then was renewed, while the company was reorganized, introducing some new blood. The capital stock was set at $200,000, and it is understood active operations will soon be started to begin the erection of a line to the Monongahela valley. The preliminary survey has not been made for such an extension, but several corps will be put at work soon. The distance is about 40 mines.

South Dakota.—The Yankton & Norfolk R., construction of which was suspended about two years ago, has been taken up by Omaha men, with a prospect that the line will shortly be completed and operated. Mr. N. D. Miller, a consulting engineer for the Great Northern, has been appointed general superintendent of the Yankton & Norfolk R. bridge across the Missouri river here, and will push the road to an early completion. This is the project that was begun five years ago by J. T. M. Pierce and is now being completed by his English creditors for the Great Northern to operate. Articles of incorporation have been filed by John M. Dougherty, Jamuel H. Stearns, B. J. Scannell, Louis Schroeder, B. L. Baldwin, A. C. Kennedy and James P. Euglish for the construction of the road. The capital stock is $6,000,000. The road will traverse the counties of Cedar, Knox, Pierce and Madison. Officers elected—President, James P. English; vice president, B. L. Baldwin; secretery, B. J. Scannell: treasurer, Louis Schroeder.

Texas.—The contract for the extension of the Texas Midland has been let to the Bethune-Craney Construction Co. and the work is to begin immediately and is to be completed within ninety days. For the present the extension will be from Commerce to Paris, instead of from Greenville, and the Midland will use the track of the Cotton Belt between Commerce and Greenville. As soon as the extension is completed and through trains running, the Midland will immediately begin the construction of the gap between Commerce and Greenville. The surveying corps is now nearing Paris and will get into the city this week. The line is being permanently located as the corps progresses. The termini of the Midland, Greenville and Ennis, embraces a line of road 72 miles in length, connecting with the Houston & Texas Central at Ennis, the Texas & Pacific at Terrell, and other main lines at Greenville. The new extension will make important connections at Paris, especially with the Frisco, shortening time between this and other points to St. Louis several hours. The subsidy committee at Cooper guarantees President Green the right of way across the country, depot and grounds and $8,000.

INDUSTRIAL NOTES.

Cars and Locomotives.

—The Gould Car Coupler Co. is meeting with considerable success in the introduction of its coupler and platform on European railways. This company hopes to eventually get all railway companies to abandon the use of side buffers.

—The Pittsburgh & Lake Erie has ordered five new passenger engines with 68 in. driving wheels, large steaming capacity, and equipped with modern devices.

—At Huntington, W. Va., 200 car builders at the Ensign Car Works have gone out on a strike. They demand $1.00 more wages on the car.

—The Delaware, Lackawanna & Western Shops, at Dover, N. J., are crowded with repair work. They are putting vertical plane couplers and air brakes on all cars that come in for repairs.

—In addition to the locomotives the Richmond Locomotive Works are to build for the Baltimore & Ohio, General Manager Green has contracted with the Cooke Locomotive Works for ten high-grade engines of the consolidation type, with 22 x 28 in. cylinders.

—The Baldwin Locomotive Works have, up to May 1, built a total of 688 locomotives compounded on the Vauclain system, and the fact which is most encouraging for the future of that engine is that they receive many orders for duplicates from those who have used the engine, also for cylinders to change from simple to compound, on roads that have made a trial of the compound.

—The order for new cars for the Cold Blast Refrigerator Co., noticed last week, was for 100 cars instead of 50 as printed.

—The Illinois Central (not the Michigan Central as reported) has submitted specifications for 800 box cars.

—The order for 200 cars for the Florida East Coast Ry. has been let to the Elliot Car Co. of Gadsden, Ala.

—The Baldwin people have recently received orders for four locomotives from the San Francisco & San Joaquin Valley Ry., and two for the Wisconsin & Michigan.

—We are advised by the Ensign Manufacturing Co that the Chesapeake & Ohio Railway Co. has just awarded to that company the contract for building 100 of their 30 ton standard hopper bottom coal cars.

—It is announced that the Northern Pacific is about to change four of its standard mogul 18 x 24 engines into compounds. They will all be different types—Richmond, Schenectady, Brooks and Pittsburgh. The intention is to put them into service, running against simple engines of the same type, and make comparisons between the compounds themselves and between the simple engines. Three of the consolidation engines belonging to the road, of their old pattern, are also about to be changed into Vauclain compounds.

—President E. H. R. Green, of the Texas Midland Railroad, has placed an order with the St. Charles Car Co. for $125,000 worth of rolling stock. The order includes seven new coaches, five baggage cars, fifty furniture cars, ten tank cars, five cabooses, seven new passenger and freight engines and a private car to accommodate nine persons to be named the Lone Star.

—The mechanical department of the Erie has designed a new ore car of 80,000 lbs. capacity. None of the cars have been built yet, but it is expected that a trial car will soon be built in the company's shops at Susquehanna.

—The Pittsburgh Locomotive & Car Works, Allegheny, has received an order for four freight engines from the Southern Railway.

Bridges.

—Plans have been and bids will be called for in a few days for two bridges in Schenley Park, Pittsburgh, Pa. A 105 ft. stone arch, with 80 ft. roadway and a total length of 341 ft. The timber viaduct over Junction Hollow will be replaced by a steel arch 360 ft. long, with masonry approaches, giving a total length of 700 ft. Estimated cost of the work is $400,000.

—The contract for building a bridge across the Merrimac river at Manchester, N. H., for $97,100, has been awarded to the Groton (N. Y.) Bridge and Manufacturing Company.

—The bill authorizing the construction of a suspension bridge over the Niagara River at Lewiston, N. Y., has been signed by President Cleveland.

—The contract for constructing the bridge over the Lehigh river at Freemansburg, Pa., has been awarded to Pascoe & Crilley, of Allentown, Pa.

—J. O'C. Campbell, S. A. Tomes, S. S. Miller and others will apply on June 22 for a charter for the Central Bridge Co. to build a highway bridge over the Monongahela river at Fifth avenue, McKeesport, Pa. The bridge that the new Butler & Pittsburgh Railroad Company will need to cross the Allegheny river is authorized by the bill that Senator Quay introduced in the senate and Congressman William A. Stone in the house. The bridge is to be located within the limits of Allegheny county at some point northeast of the eastern boundary of Pittsburgh. It must not be an obstruction to navigation, and its construction is to be under the control of the secretary of war.

—Plans are being prepared by the engineer of the grade crossing commission for a viaduct over 500 ft. long at Chicago street, Buffalo, N. Y. Work will probably be begun about June 15. Arrangements are also being made for building a 3,000 ft. viaduct at Seneca and Smith streets.

—Press reports state that at a joint meeting of the county commissioners of Fayette and Somerset counties May 21 plans were adopted for the new iron bridge over the Yough river at Confluence, Pa., to be built by the two counties. The plans of Taylor, Romrine & Scott, of McKeesport, Pa., were accepted for the abutments, and the King Bridge Co., of Cleveland, O., for the structural iron work. The contract for the bridge will be awarded June 10.

—The Florida East Coast Railway Co. proposes to build a 250 ft. steel girder draw bridge across the Miami river at Miami, Fla., which is the new terminus of that railway. The bridge will be constructed to accommodate both trains and carriages. Proposals will be asked for.

—The St. Charles & St. Louis County Bridge Co. has been incorporated with a capital stock of $20,000, to construct and maintain a highway bridge and approaches across the Missouri river at St. Charles, Mo.

—The awarding of contracts for the construction of a bridge at Cumming, Ga., has been postponed, and bids will be readvertised for.

—The board of public improvements of St. Louis, is discussing the question of building a viaduct over the railway tracks at Kings Highway, of stone, at a cost of $450,000, or of steel, to cost $250.000.

—Chas. M. Heald, general manager of the Chicago & West Michigan Railroad Co., has recommended the construction of a new iron bridge over the Grand River at Grand Rapids.

Buildings.

—The plans for the new buildings to be erected by Geo. B. Sennett & Co., of Youngstown, call for a foundry 175 ft. long by 75 ft. wide, and the machine shop 225 ft. long by 60 ft. wide. The buildings will be very substantial ones, and will be constructed of brick, stone and iron, and will be practically fire proof. The principal line of goods to be manufactured will be oil well and artesian well supplies. The capacity of the foundry will be 38 tons per day, and the capacity of the works two car loads of finished machinery in the same time. All the machinery to be used in the plant will be of modern design.

—Montgomery, Ala., is to have a new passenger station to cost $350,000. The Louisville & Nashville Co. will build it, but it will be used by all of the roads as a union station. The structure is to be three stories high and built of brick, stone and iron. The baggage house, an independent building, will be east of the parallel with the passenger depot and the express office, another separate building, will be at the west end. The passenger depot building will be 309 ft. in length. The car shed, which will extend from Commerce street to Moulton street, will

be 600 ft. long. A freight depot, 50 by 400 ft. will be built.

—The Cleveland Frog & Crossing Co. has let the contract for the erection of an iron building, 100 x 170 ft., to be used for storing tools and machinery, giving better protection from fire. With this new building, the company will have a plant 440 ft. long and wide enough to make 58,000 ft. of floor space. The company is well supplied with orders for both electric and steam.

—The Pioneer Storage Warehouse Co., Brooklyn, N.Y., is about to lay the foundation of a 10-story fireproof building, corner of Flatbush avenue and Rockwell place. The new building will cost $100,000.

—The Santa Fe Railroad Co. has let a contract for an additional shop building at Argentine, near Kansas City, to cost $10,000, exclusive of machinery. It will be of wood and will largely increase the facilities at Argentine.

—It is stated that the Great Northern Railway Co. will build an extensive series of docks and sheds on the Blackwell Canal at Buffalo, N. Y.

—It is repotred that the citizens of Portland, Me., have subscribed $175,000 in cash toward building a grain elevator of 1,000,000 bushels capacity for the Grand Trunk Ry. The Grand Trunk will furnish $75,000 more.

—C. C. Woodruff, the Pittsfield contractor, is building a round house for the Sebasticook & Moosehead Lake Railroad at Pittsfield, and is also to build all the stations along the extension of this line.

—It is stated that the Mount Carmel Iron Works will soon build additions to its plant.

—A petition for the incorporation of the Georgia Car & Manufacturing Co. will be filed within the next few days. The company will be composed of Savannah capitalists, and the capital stock will probably be $500,000. A deal has been completed for an eighty acre tract of land, upon which the plant will be located, at the junction of the Florida Central & Peninsular and the Charleston & Savannah Railroads. The Central Railroad will also have access to it by way of the Florida Central and Peninsular. It was purchased from A. R. Fawcett, at a cost of $15,000. The idea of this plant was conceived by several well-known Savannahians, who some time ago bought a car works plant at Huntingdon, Pa. This plant, it is understood, they paid $55,000 for, which was considerably less than its real value; but the plant had been shut down for some time, and it was secured at a bargain. It is said that the property in this plant is to be represented by $300,000 of common stock that is to be issued. After securing the plant the gentlemen interested went to work to secure further working capital, their object being to get $100,000 in first mortgage bonds. This they have finally succeeded in doing, the bonds being taken quite generally by those in the city who have money for investment. There are to be four branches to the plant; first a car building and a car repairing branch; next a manufactory of vulcanized wood, a substance which is now being largely used as cross ties by many railroads north and for other purposes where a hardened material is required; third, a car wheel foundry, and fourth, an establishment for making axles. This covers practically the whole range of the railroad car industry. The work of construction will be begun at an early date.

Iron and Steel.

—The plate mill of the Mahoning Valley Iron Co., at Youngstown, is filling an order for the Daniels Steel Tie Co. The improvements being made upon the plate mill for the mannfacture of heavy plate will make this mill one of the best in the Mahoning valley.

—W. R. Stirling has resigned his position of first vice president of the Illinois Steel Co., and will devote all his time to the business of the Universal Construction Co., of Chicago, of which he is president. C. H. Foote, manager of the south works of the Illinois Steel Co., has been elected first vice president.

—The sale of the iron furnace erected at Decatur, Ala., by the Decatur Land Co., seven years ago at an expense of $111,000, has not been consumated and most likely will not be.

—H. F. J. Porter, western representative of the Bethleham Iron Co., recently delivered a lecture on modern methods of making steel forgings in America, at the Armour Institute, Chicago. The lecture was illustrated with views of the Bethlehem works and the forging plant.

—Bowler & Co., of Cleveland have sold their wheel foundry and car wheel business to the Standard Car Wheel Co., a new corporation for making car wheels exclusively. C. A. Brayton is president, and W. L. Bowler, general manager.

—The Carnegie Steel Co., Ltd., has closed an order for steel rails for the Japanese government to be used on the China-Japan Railroad. The order was for 10,000 tons of rails and was the second of similar size from Japan filled by the company this year. The rails have been shipped to Baltimore and from there will go by steamship.

—The Brown Bonnell Iron Company, of Youngstown, has received a large order for 2.000 tons of channel iron to go to Cincinnati to be used for building purposes.

Machinery and Tools.

—The Elliott Frog & Switch Co. of East St. Louis states that its works were not materially damaged by the recent tornado and that work was resumed on Monday, June 1.

—Four attractive and interesting circulars designated by the letters A, B, C & D, have just been received from the Industrial Works of Bay City, Mich., manufacturers of steam pile drivers, steam shovels, locomotive cranes, wrecking cranes, transfer tables and similar machinery. Circular A is devoted to an illustrated description of pile drivers of 3 types, namely, "The Standard Adjustable Extension," "Special Long Extension," and "Light Special Type Non-Extensible." Under the first type is shown an extra heavy driver furnished the N. Y. C. & H. R. Ry., which is illustrated from a photograph. This circular also shows four types of pile driving engines and boilers built by this concern. Circular B illustrates steam shovels for work in iron ore, for stripping and also for the heaviest railroad work and ballasting. The illustrations show a standard shovel for heavy work and another large shovel in use at Lulea, in the Swedish government mines. Circular C presents the subject of locomotive cranes in capacities of from 3 to 30 tons. The illustrations in this pamphlet, which has 8 pages, are good, and they are accompanied by the necessary descriptive matter. One of the illustrations shows a locomotive crane of 15 tons capacity furnished to the United States navy yard at Washington, D. C., for handling guns, gun carriages and similar forgings about the yards. Circular D illustrates wrecking cranes of from 10 to 35 tons capacity, and this pamphlet should be consulted by those interested in the purchase of such machinery. The pamphlets are all standard size, 9x12. The letter press is good and the illustrations are well presented. The series may be obtained by application to the general office and works at Bay City, Michigan.

—The Jones & Lamson Machine Co., of Springfield, Vt., has recently shipped flat turret forming lathes to the following railroads: Illinois Central, Chicago; Cleveland, Cincinnati, Chicago & St. Louis, Indianapolis; Chicago & Northwestern, Chicago; also to the Peckham Motor Truck & Wheel Co., Kingston, N. Y.; the Cambria Iron Co., Johnstown, Pa., and the Reading Iron Co., Reading Pa.; besides two machines to a Russian gun factory and three machines to Germany.

—The Davis & Egan Machine Tool Co., of Cincinnati, has received orders for twelve drill presses to go to England; one tool room lathe for Paris; one hub and cone machine for Stockholm; three engine lathes, two universal milling machines and one universal radial drill for Mexico.

—The St. Louis Steam Engine Co., St, Louis, Mo., has put on the market an air compressor that has some advantages over the ordinary machine for shop work. It is driven by a vertical steam engine and is itself a vertical machine, in appearance much like its motor, and located on the same base plate. The air cylinder is water-jacketed both on the heads and sides. The cranks are set quartering, so that the engine is developing the most power at the moment the compressor is required the most. One of the great advantages of this form of compressor is that it can be run at night or on holidays without running the main engine and line shaft. Many tools are now driven out of hours by small air engines, and an independent compressor at such a tiime is the most economical and convenient.

—The Ranken & Fritsch Foundry & Machine Co., of St. Louis, has its shops running on two engines 1,200 horse power each for the Illinois Steel Co.; a 36 x 60 engine for the Midland Steel Co., of Muncie, Ind.; a 600 horse power engine to run dirgct connected generator, at a speed of 120 revolutions, for the Union Depot Railroad Co., and other small engines.

—Watson-Stillman Hydraulic Co., 204 West Forty-third street, New York City, has issued a new supplementary catalog of its jacks, crack-pin presses, wheel presses and rail benders for use on railroads. It can be had on application.

—It is now apparent that the car dumping machines are to replace, almost entirely, the old system of loading soft coal at Lake Erie ports. Probably not less than ten of these big machines will be in operation before the present season is at an end. The machine that is to be operated by the Cuddy-Mullen Coal Co. on new docks erected by the Pennsylvannia Co., within the eastern arm of the breakwater, Cleveland, was given two or three trials at loading vessels within the past week, and its operation is highly satisfactory. This is a side-dump machine, designed and built by the McMyler Mfg. Co., of Cleveland, but not of the same type as the machine which that company built at Ashtabula some time ago. The Cuddy-Mullen Co., through its arrangements with managers of the Pennsylvania Railroad and the Northern Steamship Co., has laid the foundation for a big dock industry in the outer harbor at Cleveland and they should be encouraged by an extension of the eastern arm of the breakwater, so as to insure smooth water at the docks throughout the season of navigation.

Miscellaneous.

—Henry L. Leach, of Cambridge, Mass., has built a model instruction apparatus of his pneumatic track sander. This is a complete sander with hose connection, loaded and ready for business, and only costs $4. No air brake instruction car or room is complete without one.

—The Wood Preserving Works of the Southern Pacific at Houston, are running full time and will treat this season about 600,000 ties by the chloride of zinc process.

—The New York Belting & Packing Co. has equipped a train of Wagner palace cars with its rubber tiling, which presents a handsome appearance. This covering looks well, is particularly durable, and is far less likely than carpets to hold dirt and disease germs.

—Geo. Westinghouse, Jr., says that the Westinghouse Co. has now perfected an electric motor system which they are convinced will work satisfactorily on the elevated railroads in New York. Some of the directors and officials of the Manhattan Elevated Railway Co. visited the Westinghouse works in Pittsburgh last week in order to examine the system.

—The trustees of the Brooklyn bridge have made provision for the expenditure of $100,000 for new electrical equipment. Two Babcock & Wilcox boilers, of 400 horse power each, two 600 horse power engines by the Southwark Foundry & Machine Co., and two Walker generators will constitute the power and light plant. Twenty cars, 48 ft. long, equipped with electric motors, will be furnished by the Pullman Car Co. The trustees estimate that, by installing their own plant, they will save $55,000 yearly to the two cities. The improved terminal switching facilities, coupled with the new electric equipment, will enable the headway to be reduced to one minute.

—Judge Dallas, of the United States circuit court for the eastern district of Pennsylvania, filed an opinion on the 6th ult., granting the Ewart Manufacturing Co. a preliminary injunction against Jas. H. Mitchell, restraining the latter from the manufacture of an infringement of the plaintiff company's patent chain, which is known as the "Dodge Chain," and which is legally manufactured by the Link-Belt Engineering Co., of Philadelphia, and the Link-Belt Machinery Co., of Chicago.

—Ryan & McDonald, Baltimore, Md., have been notified by the United States court that they are not entitled to interest on the balance due them from the Maryland Construction Co., under contract for constructing the Belt tunnel. The balance the court found to be $133,304. The deductions to be made on account of payments by the Maryland Construction Co., for damage to buildings on the line of the tunnel will amount to about $30,000. This will reduce the sum to be received by the contractors to about $100,000.

—Mr. E. S. Marshall, formerly master mechanic of the St. Louis & Southwestern Railroad, has been made assistant manager of the Railway Equipment Co., of St. Louis, who manufacture and sell the Houston track-sanding device, the economical slack adjuster and several other railroad devices. Mr. Marshall is also manager of the railroad department of the Missouri Malleable Iron Co., of East St. Louis, Ill.

—The Page Wire Fence Co. has just completed 14 miles for the Ann Arbor Railway Co. This company has also received from the Lake Shore & Michigan Southern Railroad an order for 75⅜ miles, for immediate delivery, at nine different points in four states. A ten mile order from the Toledo & Ohio Central and a 24 mile order from the Central Vermont are among its recent contracts.

—A contract has been awarded by the receivers of the Baltimore & Ohio Railroad Company to the Continuous Rail Joint Company, of Newark, N. J., for 500,000 rail joints.

—The Shickle, Harrison & Howard Iron Co., St. Louis, Mo., has recently turned out two exceptionally heavy steel castings. One is the rim of a large gear wheel, made for the Fulton Iron Works, of St. Louis. The diameter of that rim is 14 ft. 4½ in., and it weighs over 20,000 lbs. The other is a frame of 10 ft. reach riveting machine, made for the Baird Portable Machine Co., Topeka, Kas.; that casting weighs over 20,000 lbs. also. The Baird pneumatic riveting machine will be used mostly on locomotive boilers.

—The Carbolineum Wood Preserving Co., Nashville, Tenn., writes us that the Plant system railroad has for years been a large consumer of "C A" wood preserver, and operates quite an extensive treating plant at Port Tampa, Fla. The tank in which lumber is treated with C. A., heated from 250 to 300 degrees F., is of 4,000 gallons capacity, and so arranged that two carloads of lumber can be worked through it at the same time. The officials in charge think the dipping process of treatment the best, though they have used many thousands of gallons by simple application with the brush, and, though some of this brush-treated work is well into its fourth year of exposure to the teredo and limnoria in waters where untreated timber is destroyed in six months, none of the "C. A." treated timber has been attacked.

—No other country in the world shows half the number of patents granted in the United States during the past quarter of a century, the total for this country being nearly half a million. The relation which exists between industrial demand and inventive activity is very close. During the past year there has been exceptional attention awarded the line of compact baling of cotton, pneumatic straw packers, aluminum for electrolytic action, bicycles, telephones and electric locks. Pneumatic drills for cutting stone have been placed on a higher plane of utility and the requirements of several large western enterprises, like the Chicago drainage canal, have led to the production of excavators of wonderful capacity and power.

—The Martin Anti-Fire Car Heater Co., of Dunkirk, N. Y., has been absorbed by the Consolidated Heating and Lighting Co.

—The Cleveland Twist Drill Co., Cleveland, Ohio, takes pleasure in announcing to its friends and the trade in general through the columns of the Tradesman that the Franklin Institute, of Philadelphia, after carefully examining into the merits of their grip sockets, have awarded to them the Edward Longstreth medal of merit. This action on the part of the Franklin Institute indorses the statements that this grip socket is the best device for holding and driving taper shank drills that has ever been introduced.

—An Ingersoll-Sergeant compressor of the "class A" pattern 16 x 14¼ x 18 in. has just been installed at the St. Louis shops of the Pullman Co. A 14½ x 18 in. class D duplex piston inlet air compressor of the same make, having a capacity of 400 cu. ft. free air per minute will soon be placed in the works of the Pullman Co., at Pullman, Ill.